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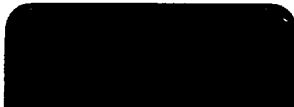
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Cambridge, MASS.





TWENTIETH ANNUAL REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY

TO THE

SECRETARY OF THE INTERIOR

1898-99

CHARLES D. WALCOTT
DIRECTOR

IN SEVEN PARTS

**PART I.—DIRECTOR'S REPORT, INCLUDING TRIANGULATION
AND SPIRIT LEVELING**



WASHINGTON
GOVERNMENT PRINTING OFFICE
1899

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**PART I.—DIRECTOR'S REPORT, INCLUDING TRIANGULATION
AND SPIRIT LEVELING**

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The resolution was referred to the Director of the Survey for a report thereon, and on December 21, 1898, the following letter and report (Senate Document No. 40) were transmitted to the Secretary of the Interior and by him to the Senate:

LETTER FROM THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY, TRANSMITTING A REPORT ON JOINT RESOLUTION (S. R. 205) TO PROVIDE FOR A DIVISION OF MINES AND MINING IN THE UNITED STATES GEOLOGICAL SURVEY.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., December 21, 1898.

SIR: I have the honor to transmit herewith a letter to the chairman of the Senate Committee on Mines and Mining and a report on joint resolution (S. R. 205) to provide for a division of mines and mining in the United States Geological Survey.

I believe that the mining interests should have a clearly defined representation in the organization of the Government, and that either this proposed division or a bureau of mines should be established. I think that such a division or bureau would be of decided and practical value to the mining interests of the country.

I am, with respect, your obedient servant,

CHAS. D. WALCOTT, *Director.*

The SECRETARY OF THE INTERIOR.

Approved and forwarded to chairman Senate Committee on Mines and Mining.
C. N. BLISS, *Secretary.*

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., December 21, 1898.

SIR: In accordance with the indorsement on the copy of the joint resolution to provide for a division of mines and mining in the United States Geological Survey (S. R. 205), I have the honor to submit the accompanying report, which is arranged under the following headings:

1. Introduction.
2. Foreign bureaus of mines and mining.
3. Free mining.
4. Statistics.
5. Economic and mining geology.
6. Special economic investigations.
7. Museum of practical geology.

The only change that I have to suggest in the resolution is that there be added after the word "investigations," in line 10, page 2, the words "and surveys," so as to read, "and making investigations and surveys in relation to mines and mining generally."

The general law of the Geological Survey provides for "the classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain." It does not appear to provide specifically for the representation of the mining interests of the United States and for the work that should be done to properly represent them. In view of this, and of the necessity of having some bureau of the Government give attention to the great mining interests of the country, I think it desirable that the proposed division of mines and mining

be established in the Geological Survey, or, if that is not best, that a division or an independent bureau be established in some department of the Government.

The appropriation mentioned in the resolution (\$150,000) would be sufficient for the statistical work and for investigations which have been waiting many years to be undertaken owing to lack of funds and proper authority. These would include the problems connected with coal, iron, gas, and oil of the Appalachian region from New York to Alabama; the nonmetallic mineral products, such as clays, borax, soda, etc., of the interior regions, and the great mineral product of the mining States of the North and Northwest.

The total metallic mineral product for the calendar year 1897, which includes pig iron, silver, gold, copper, lead, zinc, aluminum, antimony, nickel, and platinum, considered as commercial commodities, was \$269,006,330; and the nonmetallic product, such as coal, building stone, petroleum, clays, quarry products, etc., valued at the point of production, was \$329,113,845, making a total mineral product commercially valued at \$598,120,175.

If the usual census of the mining industry is made for 1900, it will cost about \$200,000. This need not be expended if the proposed division is established in the Geological Survey.

Yours, with respect,

CHAS. D. WALCOTT, *Director.*

Hon. WM. M. STEWART,

*Chairman of Committee on Mines and Mining,
United States Senate.*

REPORT ON A PROPOSED DIVISION OF MINES AND MINING IN THE UNITED STATES GEOLOGICAL SURVEY.

1. INTRODUCTION.

There has been a sentiment growing among the mineral producers throughout the United States that the Government has not given as much attention to mining as the importance of that industry demands; that inasmuch as there is a Department of Agriculture, there should also be a department of mines, or at least a bureau in which mines and mining should form a part of the title. There does not seem to be any well-defined idea of what the scope or duty of such a bureau should be or what relations it should sustain to existing bureaus of the Government dealing more or less indirectly with statistics and matters relating to mines and mining. It appears that many of the advocates of the establishment of a department of mines and mining have lost sight of the fact that an existing organization, the Geological Survey, includes among its duties many that could be done by such a department; that by the establishment of a division of mines and mining within the Geological Survey the mining interests of the country would have a clearly defined representation in the organization of the Government; that if properly provided with means for the collection of statistics and investigation of all matters pertaining to mines and mining, and publication of the statistics and information thus gathered, the interests of the mining industry would be properly cared for.

2. FOREIGN BUREAUS OF MINES AND MINING.

Practically all governments except the United States have established a system of inspection and regulation of mines throughout their domain, and many have, through their geologic and other surveys, prepared topographic and geologic maps that have been of material aid in the development of mining interests.

The duties of the officer corresponding to a suggested commissioner of mines vary materially in the different countries. At the present time the functions discharged by the inspector of mines in Great Britain are in this country performed by the

General Land Office, the Department of Labor, the Geological Survey, special inspectors of mines, who report to the Secretary of the Interior, and the Director of the Mint, who assembles the statistics relating to gold and silver.

In Great Britain there is but little statutory legislation on the whole subject of mining beyond that which relates to the regulation and inspection of mines. In the absence of such general legislation the legal questions governing the ownership and working of mines and minerals have been determined by decisions of the courts, based on the general principles of the common law and on local customs. The regulation and inspection of mines is now in charge of the home office, to which the inspector of mines reports in relation to the mines and upon the mineral statistics.

Great Britain has been very liberal in making topographic and geologic surveys, for general information and for assistance in the development of the mining resources of the United Kingdom. In 1791 a general triangulation of the Kingdom was begun, which was completed in 1853. With the beginning of triangulation topographic and cadastral work was inaugurated, and the cadastral work still continues. The work was originally in charge of the war department, under the board of ordnance. In 1870 the ordnance survey was transferred, without change of personnel, from the war department to the commissioner of works. The geological survey of England was organized in 1832 and that of Ireland in 1845. In 1854 the geological survey of Scotland was made a distinct branch, and in 1877 the title of Great Britain was dropped, and the geological survey of the United Kingdom then included the surveys of England and Wales, Scotland, and Ireland. It was at first a bureau of the ordnance survey, but is now a branch of the department of science and art. In 1859 a mining record office was established.

In France the head of the mining administration is the minister of public works, and in each department the prefect is the head of the service, under the authority of the minister of public works. Then there follow (1) the council-general of mines, made up of the inspectors-general of the first and second class; (2) engineers in chief, divided into three classes; (3) ordinary engineers, divided into three classes, and (4) "gardes-mines," divided into four classes.

The French system is one of almost absolute State control in regard to concessions for mining and inspection and regulations of mines. It is in strong contrast with the policy of Great Britain.

France has prepared an elaborate topographic map on the scale of 1:50000, or less than 1 mile to the inch. Its first mineral survey was begun in 1789. In 1822 a plan was adopted for the preparation of a general geologic map. The map, with explanatory text, was published in 1841. It was upon a small scale, and even before it was published a new survey was begun under the various departments. The existing survey was instituted in 1868, and has for its primary object the preparation of a detailed geologic map of France. It is under the minister of public works.

In Germany the mining administration is under the charge of a minister of public works, the provisions of the mining law being intrusted in the first instance to an official in each mining district, and in the next to a council, of which there are five in Prussia, and in this State the mining authority alone (and not, as in other countries, in conjunction with civil authority) has entire jurisdiction of matters relating to mining, except with regard to surface damage.

The geological surveys in the Empire of Germany are not wholly under the direction of the Imperial Government. Several of the States have geological surveys of their own, such as Prussia, Saxony, Bavaria, etc. At first geological investigations were carried on under the royal superintendence of mines, constituting a division of the department under the minister of commerce, industry, and public works. In 1873 the survey was reorganized, being modeled chiefly after the surveys of England and Austria. Its official relations are with the department of commerce, industry, and public works. The topographic maps which it uses are prepared by another department of the Government.

In New South Wales all matters relating to mining on Crown lands are vested in

a minister of mines, who appoints a set of officials to carry out the provisions of the mining act. There is also a mining board, which makes regulations subject to the approval of the governor.

Nearly all countries have some form of mining establishment and geological survey, but the four mentioned illustrate the prevailing types.¹

From a review of the laws and the plans of organization of the institutions controlling the mining interests of the various countries, excepting the United States, it is evident that the bureaus, etc., were primarily established for the purpose of government inspection, regulation, and supervision of mines, on account of the government having a direct pecuniary interest either in the output of precious metals or, in the case of many, in all minerals mined.

3. FREE MINING.

The United States Government has never asserted the right of sovereignty in or over its precious metals, and rarely over any mineral product. In 1807 a system of leasing the lead and copper mines was adopted for the purpose of securing revenue. After a trial of nearly forty years the system was pronounced a failure, and in 1846 the mines were offered for sale. When the gold mines of California were discovered and the great mineral wealth of the Pacific coast was brought to the attention of Congress, several revenue bills were introduced at different times and earnestly debated, but no action was taken that interfered with free mining.

From long association with mining men engaged in active mining operations in all sections of the country, I doubt that any scheme providing for Government interference in mining operations would be acceptable to the mining industry of the United States. At the present time the State laws, although in many cases inadequate, appear to provide protection for mining employees. This question, however, is one that could be properly investigated by the proposed division of mines and mining. The same also is true of the Federal laws relating to mining in the portions of the public domain not under State governments.

4. STATISTICS.

At the present time the statistics of mineral production are gathered and compiled by the Division of Mineral Resources of the Geological Survey, with the exception of those of gold and silver, which are under the charge of the Director of the Mint. With a very little additional cost the gathering of statistics of minerals other than those of gold and silver can be perfected so as not to require any considerable additional expense or increase of force. For the purpose of gathering more satisfactory statistics of gold and silver they should include—

1. A statement of the total number of ounces of gold and of silver obtained from the mines of the United States.
2. A statement of the foreign gold and silver refined at domestic works.
3. A statement (as accurate as the total statement) of the amounts furnished by each district.
4. A simple division of the gold into classes according to its source, viz, placer gold and vein gold, and subdivision of the vein gold into gold from "smelting" ores and gold from "lean" or free-milling ores.
5. A statement of the character of the predominant ores from each mining district, such as placer gold, free gold from quartz veins, refractory sulphurets, silver-lead ores, tellurides, etc., and a brief statement of such conditions of occurrence as markedly affect the methods of mining and limit the grade of ore which can be mined at a profit.

¹The mining laws of Europe are well summarized up to 1889 in *Annali di Agricoltura*, 1889: *Leggi minerarie del l'Europa*, published by the ministry of agriculture, industry, and commerce, Rome, Italy. There is also a valuable guide to the mining laws of the world by Oswald Walmesley, published by Eyre & Spottiswoode, London, 1894.

6. A statement of the methods of treatment employed in each district and the measure of success attending them.

Many other interesting subjects of inquiry have been suggested by various authorities, which do not seem proper for an annual exclusively statistical report, but which could properly be included in a report covering the mining industry in its entirety. Among them is the suggestion to include a technical inquiry into the various processes of extraction of gold and silver, such as the cyanide process, chlorination, the corresponding bromine process, and even a more exact study of amalgamating methods. An entirely different line of work would be still more valuable, viz, to determine the number of persons employed in mining operations, the wages paid, and other items of expense leading to the statement of the cost of producing gold and silver; but it seems proper to exclude all these subjects, leaving the technical themes for the papers of associations of mining engineers, and the consideration of cost to a decennial inquiry.

No division of the gold product into placer gold and vein gold has been attempted for years, yet the continued demand for this information indicates the advisability of publishing it. Placer gold has in history been the source from which sensationally large supplies of gold have come at short notice and with marked effect upon the gold market, while vein gold has been the product of slow development, with the investment of much capital and the establishment of contributory industries.

The intelligent investment of capital in precious-metal mines, on business rules and without especial speculative excitement, depends essentially upon information impartially collected and widely distributed as to the characteristics of the ores which furnish most gold and silver in each district. The adaptability of these ores to various methods of treatment must be simply but clearly set forth. This can best be done by a few general statements concerning each camp, showing what processes have contributed most gold for each kind of ore.

The information demanded from the statistics of gold and silver points us to the mines themselves as the necessary source. It will constantly become more difficult to collect the statistics by the present method alone. To collect them from the mines will be difficult at first, but will steadily grow easier as the mining interests organize and consolidate and the proportion furnished by wandering prospectors and other small operators grows smaller.

It appears to be desirable for the Treasury Department that the statistics of gold and silver, included under Nos. 1 and 2 of the preceding plan for collecting them, should be collected by the Director of the Mint from the mints, refineries, etc., as at present, but I think that the Geological Survey should collect the statistics as planned under Nos. 3, 4, and 5, and cooperate with the Director of the Mint in perfecting the statistics collected under No. 1. This would give a check on the statistics collected by the Director of the Mint, and in turn check through the mint returns the statistics gathered by the Geological Survey.

Plan for collecting statistics.—The collection of the statistics would be based principally on the method of the eleventh census of mines.

A list of the gold and silver mines would be obtained by the methods now well developed in the statistical division of the Survey. Using all the facilities which exist there, this work would be rapid and as exhaustive as possible.

To each of the mine operators the following card of inquiry would be mailed:

Name and address of operator, _____.
 Location of mine, _____.
 Number of ounces, fine, of gold produced in 189—, _____.
 Value received for gold produced in 189—, _____.
 Number of ounces, fine, of silver produced in 189—, _____.
 Value for silver produced in 189—, _____.
 [Signature of producer] _____.

Sixty per cent of the product should be obtained promptly by these cards without waiting for the considerable percentage which would come slowly. A corps of

experts would clear up the various districts by personal visits. In these visits they would—

1. Revise the list of mines.
2. Collect the product of mines which had not been reported.
3. Check doubtful returns.
4. Collect the information as to the sources of gold and silver and all available information as to the conditions of occurrence and methods of reduction.

In suggesting this plan the great difficulties have been carefully considered. For example, it frequently occurs that mines are relocated, first by one party and then by another, and thus have several names, and each one of these names finds its way to the list. Again, many of the organizations have no legal existence whatever. This causes "joint companies," known by so many names as to be duplicated and triplicated in the reports. In one county in California a recent statement gave to the same mine, which appeared under two names, a product of \$75,000 under one name and \$18,000 under the other. Again, under the matter of hydraulic mines the usual answer to requests for information is, "Closed by injunction of United States courts," although the product may actually have been considerable. The greatest source of error is undoubtedly exaggeration, an incentive for which comes from owners wishing to sell mines or extensions of them, and the hope that the individual statement may be published. The following quotation will indicate a few of the difficulties met with at the time of the Eleventh Census:

Hence all the estimates from small mines and from Chinese mines contained in the Mint reports are absent in ours. Many times in the Mint reports these were duplicated. Moreover, the Mint reporters themselves found that they were imposed upon by people anxious to give their camps good names in official reports. We got all the Chinese we could and adopted good measures to obtain their figures. We had letters written in Chinese by the consul, telling them to give us the proper reports. The Mint took no such precaution, as they could only send circulars, and to those no Chinese responded.

The totals thus obtained would be verified and revised by the returns of common carriers, the mills where the ores are reduced, the smelters, and the returns of the Mint officials.

In brief, no present source of information would be neglected, but the information from mines would gradually be made complete and accurate.

At a hearing before the Senate Committee on Mines and Mining on January 25, 1897, there appeared before the committee the Director of the Mint, Mr. R. E. Preston; the Commissioner of Labor, Mr. Carroll D. Wright, and the Director of the Geological Survey. At the request of the committee the Commissioner of Labor submitted his opinion of the desirability of having the statistics on mines and mining collected by the Geological Survey. This letter was published as a part of Senate Report No. 1338, Fifty-fourth Congress, second session, to accompany Senate resolution No. 362. As it expressed very concisely the opinion of the Commissioner of Labor, it is here inserted:

DEPARTMENT OF LABOR,
Washington, D. C., January 25, 1897.

DEAR SIR: In obedience to the request of your committee this morning, I have the honor to inform you that the cost of the division of mines and mining in the Eleventh Census was \$196,236.16. This sum was exclusive of the printing and binding of the very valuable Report on Mines and Mining.

Referring to the proposition made before your committee this morning, that the appropriation for the Geological Survey for the collection of information concerning mines and mining be increased, I would say that, in my opinion, the amount asked would not only accomplish the purpose for which the appropriation is sought, but it would make it unnecessary for the Twelfth Census to take up the question of mines and mining; and thus, by making the appropriation annually for the Geological Survey, there would be a saving in the Twelfth Census of probably \$200,000.

In a report on a plan for a permanent census service, which I had the honor to make to Congress on the 7th of December last, I called attention to the advisability of eliminating certain reports from the decennial census work, and the report on mines and mining was one of them.

Mr. David T. Day, of the Geological Survey, who had charge of the division of mines and mining in the last census, did great service for the Census Office and for the public; but I believe that, could the Geological Survey have a sufficient amount of money to expend annually, the same work could be made far more valuable to those interested in the various phases of mining. In addition to the technical work which the Director of the Survey would be enabled to carry out, he would also be in a position to collect statistics of wages and employment and other matters pertaining to the individual that would add vastly not only to the interest but to the value of the annual reports of the Survey upon mines and mining.

I am, very respectfully,

CARROLL D. WRIGHT, *Commissioner*.

HON. WILLIAM M. STEWART,
Chairman Committee on Mines and Mining, United States Senate.

5. ECONOMIC AND MINING GEOLOGY.

As a matter of interest in connection with the establishment of a division of mines and mining in the Geological Survey, the following comments on economic and mining geology of the Geological Survey are inserted for the information of those interested:

It is well known that in creating the United States Geological Survey Congress and the people whom it represents expected that its energies would be largely devoted to the development of the mineral resources of the country. How this method should be accomplished was left to the Director and his principal assistants, who, by scientific training and long practical experience, were the best qualified to judge what could and what could not be done by such a corps of specialists as the Survey must necessarily consist of—men whose whole life is devoted to the abstract side of geology and whom neither the regulations of the Survey as defined by law nor the exigencies of their official duties would permit to participate in the practical or commercial development of these resources.

It was evident that these specialists could not take the place of either the prospector or the mining engineer, as a somewhat superficial view of the subject has led some to think they might. They should, of course, understand the principles that underlie the work of either of these classes of men, but they can not be expected to possess that expertness of instinctive second sense in each of these professions which can be acquired only by lifelong practice.

The Survey should furnish an accurate basis upon which the work of each of these experts, so indispensable in the development of the mineral resources of the country, may be founded. The Survey stands, so to speak, between them and nature. It should endeavor to tell the prospector where he may and where he may not prospect to advantage for this or that valuable mineral, but it can not be expected to actually find the mineral for him. It should aim to discover for the mining engineer first of all the general laws which govern the occurrence of the different useful minerals, and to show the special applications of these laws in the particular mining regions that come under survey; but it can not undertake to direct the workings of individual mines or quarries, nor guarantee that every mining engineer will make a correct application of the laws that have been discovered.

In the early years of the Survey there were practically no topographic maps upon which the surface distribution of different classes of rock formations could be indicated (areal geology), and which should thus serve as a basis for the work of the prospector. Hence it was only the study of the already developed ore deposits, for the purpose of determining the laws under which they were formed, that could be immediately undertaken. A number of monographs or exhaustive studies of important mining districts were made, during which several new laws or generalizations concerning the formation of ore deposits in general were formulated. Incidentally, the accurate geological descriptions contained in these monographs proved to be of great practical value to those engaged in mining in these particular districts. By these studies, conducted for the most part at great depths below the

surface, those engaged in them acquired a practical familiarity with many geological phenomena connected with ore deposits that could not be seen upon the surface, and were thereby specially fitted to judge of the ore-bearing capabilities of rock formations in general. This constitutes a special training that can not be acquired in the schools, but can only be imparted to the young geologist by actual experience in mining or economic work under the guidance and instruction of older geologists who have already gained it by long-continued special work.

During the last few years the topographic maps of very large areas have been completed, constituting several hundred of the sheets that will form the basis of the Geologic Atlas of the United States. Many of these sheets have already been colored geologically—that is, the areal geology has been completed—and they have been published as geologic folios. In a few cases the areas have also been studied economically; that is, the manner of occurrence of the known ore deposits has been observed, and deductions drawn therefrom are given in the folio, which will show the prospector where similar favorable conditions exist and where, in consequence, are the most promising localities to search for other ore deposits. The latter class of work is more difficult and more expensive, for many reasons, than other geological work.

The increase in effectiveness of this work must, however, proceed slowly. Even with unlimited amounts of money immediately available the economic work of the Survey could not at once be spread over the whole country, as it should be, for the reason that it would take time to train the additional number of specially prepared geologists required. But there is no doubt that by a natural enlargement of the present plan of work the demands of the mining community for Government aid in the development of their particular branch of industry can readily be largely met.

It has been generally understood that information acquired by the Government is open to all and is not for the benefit of any one individual or corporation. Language to this effect was inserted in the statute organizing the Geological Survey, in 1879. This, then, draws the line between public and private interests. There is more or less extended desire that assays and analyses and examinations of prospects and mines should be undertaken by the General Government; but it would seem to be clear that expert work and assaying should be left to individuals and corporations, so far as the General Government is concerned. State mining bureaus or schools of mines can properly assist in the study of details and lend much aid to local development, but the General Government should deal only with interstate and such other problems as the State can not well undertake.

6. SPECIAL ECONOMIC INVESTIGATIONS.

There are a number of special investigations that could be profitably made by the proposed division of mines and mining which do not properly come within the scope of any State organization, as they affect interests that are distributed through adjoining States, and frequently through many States. As an example of this, it is desirable to make a uniform and comprehensive study of coal and its resultant product—coke—petroleum and asphalts, building stones, and clays.

The coals and cokes of the United States have so far been studied mainly on the empirical side, each by itself, or at best in small series and with reference to immediate purposes. Most of the analyses have been partial only, and there have been very few complete and ultimate analyses, particularly when we consider the extent of our resources. Then, coupled with the chemical investigation, should be a thorough study of the calorific value of the various coals, not only as shown by the analyses, but through the medium of thorough and systematic practical tests. There is much need for information of this kind, not only by those interested in the coal-mining industry itself, but for the transportation and countless manufacturing industries dependent upon coal for fuel.

The coke-making industry, closely allied to that of coal mining, could also be much benefited by a study of the best methods of coke making. The prevalent method heretofore in use in this country has been an exceedingly wasteful one, in that valuable by-products generated in the coking process have been lost, and it is only within very recent years that the problem of saving and utilizing these by-products has been seriously considered. In Germany important industries have been established, based upon the utilization of the by-products—gas, tar, ammonia, etc.—produced in the coke-making process; and a systematic investigation by the Government of the possibilities of the different coals in this country, in regard to their content of these substances, as well as to their coke-making qualities, would be exceedingly valuable.

With the present laboratory force and resources the Geological Survey can do very little toward increasing our knowledge of the problems here suggested, but with increased facilities the Survey might well take up a systematic investigation, the results of which would well repay the expense involved.

Of the other great fields of economic chemical research which may be mentioned as necessary, the one regarding our petroleum and asphalt, closely linked with the investigation of coals, is pertinent. A study of our clays, with reference to pottery, terra cotta, and brickmaking, also appears to be an important field, and one which has been almost entirely neglected. The establishment of clay-working industries is all the more important from the fact that it almost invariably indicates the formation of a stable community, which is not the case with many of the mining industries.

The total value of the products mentioned above, in 1897, was as follows:

Coal.....	\$198,869,178
Coke, including the value of the coal used.....	19,234,319
Petroleum and asphalt.....	41,594,243
Manufactured clay products.....	60,911,641

7. MUSEUM OF PRACTICAL GEOLOGY.

The attention of the Director of the Geological Survey has frequently been called to the desirability of having a museum of practical geology, to be kept up to date, so connected with the Geological Survey that the officers of the Survey would have ready access to it, while it would be of constant service also in answering questions put by scientific and practical men who might visit the museum for the purpose of obtaining information in relation to any mineral product that they might be interested in, either as producer or consumer.

The Geological Survey has some 40,000 correspondents who furnish information in relation to the mineral resources of the United States. There is little doubt that a plan for a museum of practical geology would meet with the hearty cooperation of the mineral producers of the country, and that a collection of a representative display of economic minerals and quarry products could be obtained at a cost very little in excess of the actual necessary correspondence and freight charges on specimens too heavy for transportation through the mail. In a majority of cases producers would be willing to incur all expenses necessary to exhibition of their products in such a museum for the simple privilege of having their names as donors attached.

Such a collection would be quite useful in the work of the Survey and would possess great educational value for visitors. It is desirable, in view of the large outlay which is being made by the Government for geological surveys and the collection of mineral statistics, that any person interested in any mineral product should be able to secure statistical information and see at the seat of Government specimens of all products pertaining to the special line in which he is interested. For example, a person wishing to obtain information in relation to marble, either as producer or consumer, should be able to personally examine specimens of marble from the principal quarries of the United States, and by inquiry to learn all that is known of any particular marble in which he may be interested.

In addition to the series of rocks and fossils illustrating stratigraphy and succession of the sedimentary rocks, and the systematic collection of minerals and ores, an exhibit showing how geologic work benefits the daily life of the people should be developed. An illustration of this would be a representation of the artesian-water supply of the semi-arid region, showing the stratigraphy and structure of the sedimentary rocks, and how hydraulic and geologic investigations clearly indicate the regions in which artesian-water development may be carried on successfully. Mining and areal geology should also be illustrated in such a manner as to place before the student and intelligent observer the import and value of such work.

There was recently received at the office of the Survey, through the Secretary of the Treasury, a request from the Supervising Architect for information in relation to a granite that it is proposed to use in the construction of public buildings. It seems desirable that the Supervising Architect should be furnished with information as to the qualities of the granite so far as they affect it as a building stone. All such information can be furnished by the Geological Survey, with the exception of the crushing and tension tests, which, for lack of proper apparatus, must be made elsewhere. It is my opinion that every variety of granite, sandstone, limestone, and slate, and every other stone entering into the construction of a public building, should be examined and its qualities determined before a contract is entered into for its use.

In the case of well-known building stones that have already been tested by long use this is perhaps not essential, but even with this class of materials I believe that in the majority of cases it would be better in the long run to have an examination and report made, and in those instances where the material submitted is from new or relatively unknown quarries that an examination should be made at the quarries of the stone in situ, at the expense of the owner or contractor, provided it is proposed to use the stone in a Government building. If cooperation could be secured with the War Department it would be practicable to have all necessary crushing and tension tests made at the Watertown Arsenal, where there is already machinery established for the purpose.

For the proper exhibition of the collections of practical geology there should be provided, in connection with the National Museum, according to a rough estimate, at least 30,000 square feet of floor space. The collection would include, in addition to what has just been discussed, the collection of rocks and minerals and synoptic series of the fossils now included in the National Museum collections.

There exists at the present time at the National Museum a geological collection of great value, but it is not as complete as it is desirable to have it, and it can not be kept up to date with the present force and space. There should be provided within a few years a building that could accommodate all the geological collections of the Government. It is not proposed that these collections should be removed from the custody of the National Museum, but that they should be properly installed and cared for independently of the general collections of the Museum.

INCREASE OF APPROPRIATION.

It is desirable that there should be an increase in the appropriation for geologic work. The appropriations for other lines of investigation have been increased materially during the last few years, but geology has not received its proportion. At least \$40,000 should be added to this item to meet the public demand for geologic surveys, which comes from all parts of the country.

The study of the mineral deposits and areal geology of mining regions requires a knowledge of stratigraphy, structural geology in its most complex phases, petrography, and the mode of formation of ore deposits. The geologist who so combines a knowledge of all of these as to fit him for the class of economic work undertaken by the Geological Survey must be a man of exceptional qualifications as well as of unusual training. The work is of such a nature and involves so much responsibility that it can be intrusted only to men whose character justifies the highest confidence in their discretion. In view of these considerations the corps of geologists employed for economic work must be placed upon the highest footing as scientific experts. To obtain such men and to retain their services it is necessary to pay fair salaries and to give reasonable expectation of permanency in position. To do this and thus to keep the Survey in the front rank of similar organizations throughout the world it is essential that additional funds be made available for geologic work or that a Division of Mines and Mining be organized and provided with adequate means.

Several of the minor items should be increased by small amounts, in order to maintain the administration of the Bureau in a satisfactory condition. These, however, are of secondary importance as compared with the work that needs to be done under the head of geology.

NEW BUILDING.

The growth of the Survey has been large during the last five years. Increased accommodations have been secured through the favorable action of Congress, but these are not sufficient to meet the wants of the scientific force. There should be provided either an addition to the present building, and means for its rental by the Survey, or a new building specially designed and equipped for the purpose.

ACKNOWLEDGMENTS.

Various Government bureaus have cordially cooperated with the Survey in the endeavor to advance and perfect its work.

These include the Smithsonian Institution, the National Museum, the Coast and Geodetic Survey, the General Land Office, the Division of Forestry of the Department of Agriculture, and the Government Printing Office. Special acknowledgment is made to the Coast and Geodetic Survey, the General Land Office, and the Government Printing Office for the promptness and courtesy with which they have responded to numerous requests.

The members of the Survey have worked harmoniously and faithfully, cooperating with one another and with the Director in carrying forward the work intrusted to the Survey. Special mention is made of the faithful service of the chief clerk and the chief disbursing clerk, who took charge of the administrative and business affairs of the Survey during the Director's long absence in the West during the field season of 1898, and of the Editorial Division, in which an unusual amount of exacting work has been satisfactorily accomplished during the year. Mention is also made of the effective work of the Division of Engraving and Printing, and of the special methods devised by its chief and his assistants, by which a large amount of time and money is saved to the Government.

PLAN OF OPERATIONS.

The plan of operations for the fiscal year 1898-99 was laid before the honorable Secretary of the Interior on June 23, 1898, and was approved by him on July 5, 1898. This detailed plan is on file in the Department. The work of the year, hereinafter reviewed, was executed in conformity with the plans submitted and approved.

APPROPRIATIONS.

For and during the fiscal year 1898-99 there was appropriated for the work of the United States Geological Survey the sum of \$818,760.02. The acts making the appropriations set apart separate amounts for specific branches of work and for the salaries of persons connected with these branches. For convenience of reference these separate appropriations are here brought together and classified.

The legislative, executive, and judicial act contained the following items:

For salaries of director, chief clerk, chief disbursing clerk, librarian, and photographer, together with clerks, messengers, watchmen, et al.....	\$31,390.00
For rent.....	11,200.00
Total.....	42,590.00

The sundry civil act included the following items:

For pay of skilled laborers, etc.....	13,000.00
For topographic surveys.....	\$180,000.00
For pay of two geographers and two topographers.....	9,200.00
Total for topographic work.....	189,200.00
For geological surveys.....	110,000.00
For pay of four geologists.....	13,700.00
Total for geologic work.....	123,700.00
For paleontologic researches.....	10,000.00
For pay of two paleontologists.....	4,000.00
Total for paleontologic work.....	14,000.00
For chemical and physical researches.....	7,000.00
For pay of one chemist.....	3,000.00
Total for chemical work.....	10,000.00
For general investigations in Alaska.....	5,000.00
For gauging streams and determining water supply.....	50,000.00
For preparation of illustrations.....	14,000.00
For preparation of report on mineral resources.....	20,000.00
For purchase of books and distribution of documents.....	2,000.00
For engraving and printing maps.....	60,000.00
For rent.....	6,200.00

There was appropriated in the same act for engraving, printing, and binding publications of the Geological Survey, \$37,000; this sum to be disbursed, not by the Geological Survey, but by the Public Printer. The items are as follows:

For engraving illustrations for report of the Director.....	\$7,000.00
For engraving illustrations for monographs and bulletins.....	10,000.00
For printing and binding monographs and bulletins.....	20,000.00
Total for engraving, etc.....	37,000.00

Furthermore, the same act contained the following special appropriations:

Special appropriation for the survey of forest reserves.....	150,000.00
Any balance of appropriation for surveying the boundary line between Idaho and Montana unexpended June 30, 1898, reappropriated for fiscal year 1899.	

The Indian Department act approved July 1, 1898, contained the following items:

Irrigation investigation of Gila River and Queen Creek, Arizona..... \$20,000.00

The appropriation for resurveying Chickasaw lands unexpended June 30, 1898, can be used for office and field expenses of said work for fiscal year ending June 30, 1899.

The deficiency bill approved July 7, 1898, contained the following items:

For engraving illustrations for monographs and bulletins....	\$10,000.00
For printing and binding monographs and bulletins	30,000.00
For preparation of illustrations, 1895.....	3.50
For geological Surveys, 1896 and 1897	350.40
For gauging streams, 1897.....	38.25

The balance of appropriation for resurveying the Chickasaw lands not necessary for completion of said resurvey may be used for topographic sheets of Indian Territory extending into Texas, and continue available for 1899.

To pay amounts found due by the accounting officers of the Treasury, fiscal years 1895 and 1896.....	93.75
	<hr/> 40,485.90

In the urgent deficiency bill approved January 28, 1898, there was the following provision:

The appropriation of \$20,000 for Alaska surveys to continue available until June 30, 1899.

The deficiency bill approved March 3, 1899, contained the following items:

For topographical surveys 1897 and 1898.....	\$106.06
For geological surveys 1897 and 1898.....	890.71
That in the form provided by existing law the Secretary of the Interior may file and approve surveys and plats of any right of way for a wagon road, railroad, or other highway over and across any forest reservation or reservoir site, when in his judgment the public interests will not be injuriously affected thereby.	
For geological and topographical surveys in Alaska 1898 and 1899.....	7,089.60
For the payment of the transmission of public documents through the Smithsonian Exchange 1898 and 1899.....	2,997.75
For locating the ninety-eighth meridian, under the supervision of the Director of the Geological Survey.....	6,300.00

A joint resolution (Public Resolution No. 25) approved March 1, 1899, made the following appropriation:

That the Director of the Geological Survey is hereby authorized and directed to prepare maps of Alaska, showing all known topographic and geologic features, including what is known of the gold-bearing rocks, and a text of the same, the text to contain also an explanation of the best

known routes and methods of reaching the gold fields; twenty thousand copies of the maps and text to be printed, five thousand for the use of the Senate, ten thousand for the use of the House of Representatives, and five thousand for distribution by the Geological Survey; and the Director is authorized to have said maps and text prepared and printed in the engraving and printing division of the Geological Survey..... \$4,200.00

818,760.02

Of this amount, the sum of \$11,570.02 was appropriated for work done during preceding years, leaving a balance of \$807,190 to be expended for work to be done during the fiscal year 1898-99

ORGANIZATION.

For convenience of administration, the following scheme of organization of the work and business of the Survey was adopted some years ago. By this scheme the work is primarily divided into four branches, in each of which there are a number of divisions:

Organization of the Geological Survey.

Branch.	Division.
Geologic	{ Geology. Paleontology. Chemistry. Hydrography. Mineral Resources.
Topographic*	{ Triangulation. Topography. Geography and Forestry.
Publication	{ Illustrations. Editorial. Engraving and Printing.
Administration	{ Documents, Correspondence, and Records. Disbursements and Accounts. The Library.

ALLOTMENTS.

ALLOTMENTS TO GEOLOGIC WORK.

As stated above, the total appropriation for geologic work for 1898-99 was \$123,700. The following table exhibits the

allotments that were made to the heads of the several geologic parties:

Allotments to geologic parties.

Party.	Amount.
1. Executive office	\$9,280
2. N. S. Shaler (Massachusetts)	2,000
3. B. K. Emerson (Massachusetts, Connecticut, and Rhode Island)	750
4. T. N. Dale (New York and Vermont)	2,000
5. J. F. Kemp (New York)	1,000
6. J. E. Wolff (New Jersey and Vermont)	700
7. H. S. Williams	1,000
8. David White (Pennsylvania, West Virginia, Virginia, Kentucky, and Tennessee)	1,900
9. C. W. Hayes (Georgia, Alabama, and Tennessee)	2,200
10. Arthur Keith (Virginia, Tennessee, North Carolina, and Maryland)	3,275
11. W. B. Clark (Maryland)	1,000
12. C. R. Van Hise (Lake Superior and Appalachian Mountain regions)	9,300
13. M. R. Campbell (West Virginia and Kentucky)	3,300
14. T. C. Chamberlin (glaciated region)	3,500
15. G. K. Gilbert (glaciated region)	4,150
16. R. T. Hill (Texas)	3,200
17. J. A. Taff (Indian Territory)	3,450
18. T. W. Vaughan (Texas)	1,200
19. W. H. Weed (Montana)	3,400
20. S. F. Emmons (South Dakota and Colorado)	8,400
21. R. C. Hills (Colorado)	1,000
22. Whitman Cross (Colorado)	5,500
23. Arnold Hague (Yellowstone National Park)	4,000
24. J. S. Diller (Oregon, Petrographic Laboratory)	5,200
25. H. W. Turner (California)	3,900
26. G. F. Becker (California)	6,800
27. J. C. Branner (California)	250
28. A. C. Lawson (California)	300
29. Waldemar Lindgren (Idaho and California)	3,500
30. Bailey Willis (Washington)	4,600
31. G. O. Smith (Washington)	3,000
32. I. C. Russell (Washington)	1,950
33. G. H. Eldridge (Alaska)	2,900
34. W. C. Mendenhall (Alaska)	1,200
35. G. W. Stose (map editing)	3,350
36. Contingent fund	11,245
Total appropriation	123,700

ALLOTMENTS TO PALEONTOLOGIC WORK.

The total appropriation for paleontologic work for 1898-99 was \$14,000, which was allotted to the various sections of the work as follows:

Allotments to paleontologic work.

Section.	Amount.
Paleozoic work	\$2,700
Mesozoic work	2,200
Cenozoic work	2,300
Paleobotanic work	4,900
Vertebrate paleontology	1,000
Contingencies	900
Total	14,000

ALLOTMENTS TO TOPOGRAPHIC WORK.

The appropriation for topographic work for 1898-99 was \$189,200, which was allotted to the several sections of the work as follows:

Allotments to topographic work.

Section.	Amount.
Administration	\$13,000
Atlantic section	60,000
Central section	48,000
Rocky Mountain section	25,500
Pacific section	25,700
Salaries of topographers in Alaska	8,000
Instruments, repairs, and contingencies	9,000
Total, including stated salaries	189,200

ALLOTMENTS TO FORESTRY WORK.

The appropriation for the surveys and investigations of the forest reserves was \$150,000, which was allotted as follows:

Allotments to forestry work.

Section.	Amount.
Topographic and subdivisional surveys:	
Rocky Mountain section of topography	\$55,500
Pacific section of topography	57,000
Forest surveys	20,000
Office expenses	8,000
Contingencies	9,500
Total	150,000

MISCELLANEOUS ALLOTMENTS.

CHEMISTRY.

For pay of all persons connected with the chemical work, and for the purchase of chemical supplies, apparatus, etc., the entire appropriation of \$10,000 was allotted.

HYDROGRAPHY.

The appropriation of \$50,000 for hydrography was allotted as follows: \$25,000 to the measurement of streams, including surveys of reservoir sites; \$10,000 to the investigation of underground currents and artesian wells; and the remainder, \$15,000, to the preparation of reports upon the methods of utilizing the water resources of the United States. (See Part IV of this Annual Report and the series of Water-Supply Papers.)

The appropriation was apportioned by States, as follows:

Apportionment of appropriation for hydrography, by States.

State or Territory.	Amount.
Alabama	\$700
Arizona	2, 120
California	3, 000
Carolinas	2, 200
Colorado	2, 920
Georgia	1, 600
Idaho	1, 580
Kansas	4, 510
Maryland	1, 100
Michigan	450
Montana	1, 700
Nebraska	4, 600
Nevada	1, 300
New England	1, 300
New Mexico	2, 000
North Dakota	1, 900
Oklahoma	200
Oregon	1, 400
Pennsylvania and New York	1, 500
South Dakota	3, 800
Texas	2, 020
Utah	1, 900
Virginias	1, 500
Washington	1, 600
Wyoming	3, 100
Total	50, 000

MINERAL RESOURCES.

The entire appropriation for the preparation of the report on mineral resources, \$20,000, was allotted to the gathering and compilation of statistical data for the calendar year 1898 and the preparation of a report on the same, which is published as Part VI of this Annual Report.

ENGRAVING AND PRINTING MAPS, ETC.

The appropriations for engraving and printing maps, for the purchase of books and distribution of documents, for the

preparation of illustrations, for pay of skilled laborers, etc., and the special appropriations were expended for the specific purposes named in the act.

WORK OF THE YEAR.

As already indicated, the general organization of the Survey, by branches and divisions, remained unchanged, and the approved plan of operations was executed in all essential particulars, such slight departures as were made being due to conditions arising during the year which could not be anticipated. A detailed statement of the work follows:

GEOLOGIC BRANCH.

DIVISION OF GEOLOGY.

NEW ENGLAND REGION.

Shaler party (Massachusetts, Rhode Island).—In Massachusetts Prof. N. S. Shaler, assisted by Mr. J. B. Woodworth, continued the field study of the geology of the Cape Cod and Narragansett Bay districts, comprising in whole or in part Norfolk, Plymouth, Bristol, and Barnstable counties, Massachusetts, and eastern Rhode Island. He was chiefly occupied, however, in the preparation of manuscript and proof, in joint authorship with Mr. Woodworth, and there are now in press an article on the Richmond coal basin, to appear in Part II of the Nineteenth Annual Report, and a volume on the Narragansett coal field, which will be issued as Monograph XXXIII.

Emerson party (Massachusetts, Rhode Island).—Prof. B. K. Emerson, assisted by Mr. J. H. Perry, continued field work in Massachusetts, making detailed investigations and mapping portions of the Worcester, Marlboro, and Blackstone quadrangles, Worcester County. Special attention was paid to the occurrence of granites. Professor Emerson's work was extended into the western portion of the Providence and Narragansett quadrangles, Rhode Island, in order to map the crystalline rocks along the border of these quadrangles adjacent to the Carboniferous strata which had been surveyed by Professor Shaler. During the winter he made microscopic studies of the

rocks of this region, including a new and interesting series of quartz-porphyrries characterized by blue quartz, microgranites, and granophyres or micropegmatites, the latter appearing as breccias of Carboniferous age. Some time was devoted to a study of the Clinton tunnel and the rocks of its vicinity. He read the proof of Monograph XXIX, on The Geology of Old Hampshire County, Massachusetts, comprising Franklin, Hampshire, and Hampden Counties, and transmitted original manuscript maps for part of the Housatonic folio (Berkshire County), which will be prepared jointly with Professors Dale and Hobbs.

Dale party (Vermont, New York).—Prof. T. Nelson Dale continued surveys in the Cohoes and Hoosick quadrangles, New York, and in the adjacent Bennington quadrangle, Vermont, devoting two months to field work. The study of the stratigraphy and structure of the Cambrian and Silurian strata in the Bennington quadrangle was completed to a junction with the surveys of Professor Wolff in the Archean rocks on the east. The results of the study of the geology of the Bennington, Hoosick, Berlin, and Greylock quadrangles, in Vermont, New York, and Massachusetts, will be published as the Taconic folio of the Geologic Atlas. The remainder of the year was devoted to the correction of the proof of a paper on The Slate Belt of Eastern New York and Western Vermont, covering Rensselaer and Washington counties, New York, and Bennington and Rutland counties, Vermont, published in Part III of the Nineteenth Annual Report; to the study of notes and specimens collected during field work; and to the preparation of a paper entitled A Study of Bird Mountain, in Vermont, which is published in Part II of the Twentieth Annual Report. Professor Dale has also commenced a paper on The Terraces of Mount Greylock, in Massachusetts.

Wolff party (Vermont, New Jersey).—Prof. J. E. Wolff, assisted by Mr. H. C. Boynton, continued and completed the geologic surveys of the Archean rocks in the northeastern portion of the Bennington quadrangle. The results will appear in the Taconic folio, which will include Professor Wolff's work in the adjoining Greylock (Massachusetts) quadrangle. Combined with the surveys by Professor Dale in the

adjoining quadrangles in New York, they will constitute an important contribution to the geology of the Green Mountains, supplementing the results obtained by the researches directed by Professor Pumpelly and published in Monograph XXIII, on The Geology of the Green Mountains in Massachusetts.

In New Jersey Professor Wolff made a thorough study of the underground workings of the zinc mines at Franklin Furnace, in Sussex County. To facilitate his work a special topographic map of the zinc district was made, on a scale of 1,000 feet to an inch, and through the courtesy of the mining company he was given access to the maps and plans of the mines.

During the winter considerable time was devoted to study of field material. A large map, combining the underground and surface features, has been prepared and will form part of the Franklin Furnace folio. Incidentally to these studies two new minerals from the workings at Franklin were analyzed and described, the one an ore of zinc (hardystonite), the other a new variety of manganese-pyroxene.

Williams party.—Prof. Henry S. Williams was placed in charge of a systematic investigation of Devonian faunas, and a report of his work in that field will be found under "Division of Paleontology," page 62. The geologic reconnaissance conducted in northwestern Maine during the previous fiscal year had afforded material for office work, which occupied him throughout the year. The study comprised the collection and classification of fossils and also the petrographic examination of the igneous rocks which are associated with the sedimentary Paleozoic rocks of Maine. The latter work was performed by Mr. H. E. Gregory under the supervision of Professor Pirsson.

Kemp party (New York).—Prof. J. F. Kemp, assisted by Prof. H. P. Cushing, of Cleveland, and later by Mr. F. J. Pope, of New York, continued the survey of the Lake Placid and Ausable quadrangles, Essex County, New York. The field season extended from July to September. Prof. C. H. Smyth, of Hamilton College, in association with Professor Kemp, conducted surveys of the Old Forge quadrangle, in the southwestern portion of the Adirondack region. Professor Kemp

has given considerable attention to the economic geology of the Adirondack region, and has accumulated some interesting data regarding the geologic relations of the iron ores. His conclusions are published in Part III of the Nineteenth Annual Report. These surveys are prosecuted as studies of the Adirondack Mountain district, and the results obtained are to be published in a folio of the Geologic Atlas, comprising the Lake Placid, Ausable, Mount Marcy, and Elizabethtown quadrangles.

Gilbert party (New York).—Mr. G. K. Gilbert pursued surveys already begun in northwestern New York, in the Niagara, Lockport, Tonawanda, Olcott, Wilson, and Ridgway quadrangles, covering parts of Niagara County. These investigations related to the mapping of under and surficial geology, including the economic resources, especially the sandstone quarries at Medina. A valuable record of a well boring was furnished by Mr. Uriah Cummings, of Akron, Ohio.

In October Mr. Gilbert returned to the office and proceeded to study and elaborate the field notes and observations. A report on Niagara County was begun, to be published by the geologic department of New York State, as part of a plan of cooperation. Three brief papers of a scientific nature were presented to the Geological Society of America. During February and March Mr. Gilbert was on leave of absence without pay. On returning to the office he continued work on the report on Niagara County until May 23, when he joined the Harriman expedition, and sailed from Seattle for Alaska May 31.

APPALACHIAN REGION.

White party (Pennsylvania).—Mr. David White continued office work throughout the season of 1898. In the spring of 1899 one month's field work was given to (1) detailed areal mapping of the Pottsville series, according to new evidence of fossil plants, from the Schuylkill along Sharp Mountain to the Susquehanna River; (2) accumulation of additional paleontologic collections from the Lykens coals in the Short Mountain region and from the Coal Measures series in the Dauphin Basin; (3) measurement of additional sections of the basal portion of the upper Carboniferous in the Southern Anthracite

field; (4) acquisition of both stratigraphic and paleontologic information sufficient to correlate the coals along Broad Mountain. These observations were extended to include the Lykens coals development along the southern margin of the Western Middle Anthracite field.

In the office Mr. White examined and made an informal report on about seventy-five collections of fossil plants from the Virginia-West Virginia district and from Indian Territory; and a formal report was prepared on a collection of Devonian fossil plants from Aroostook County, Maine. The greater portion of his time, however, was devoted to the completion of the study and description of the flora from the Pottsville series in the Southern Anthracite coal field. The preliminary report of these studies is now in preparation for publication in Part II of this Annual Report, the title being *The Stratigraphic Paleobotany of the Pottsville Formation in the Southern Anthracite Coal Field*. A report on the fossil plants of the McAlester (Indian Territory) coal field has been published in the Nineteenth Annual Report, Part III. At the close of the year Mr. White was engaged in reading proof of Monograph XXXVII, on *The Flora of the Lower Coal Measures of Missouri*, now in press.

Campbell party (West Virginia, Kentucky).—Mr. M. R. Campbell was assisted by Mr. Charles H. White. His work for the field season of three months embraced the entire and original survey of the Oceana (West Virginia) quadrangle, covering approximately 1,000 square miles in Logan, Mingo, Wyoming, Raleigh, and Boone counties, and additional surveys and revision of the Charleston and Kanawha Falls quadrangles, covering portions of Lincoln, Boone, Charleston, Kanawha, Fayette, Nicholas, and Clay counties. Mr. Campbell then proceeded to Lexington, Kentucky, to make an examination of the physical features of the valleys of the Kentucky and Licking rivers, in the hope of obtaining some light on the history of the Ohio drainage basin, but continued bad weather prevented satisfactory observations.

In the office Mr. Campbell prepared the following manuscripts and submitted them for publication in the *Geologic*

Atlas: Huntington (West Virginia) folio—maps, tables, and sections; Charleston (West Virginia) folio—maps, tables, and sections; Standingstone (Tennessee) folio—descriptive text. He also advanced the preparation of the Salyersville (Kentucky), Kanawha Falls (West Virginia), and Oceana (West Virginia) folios.

Hayes party (Georgia and Alabama).—Mr. C. Willard Hayes was engaged in field work in Nicaragua and Costa Rica, under detail by the Secretary of the Interior for duty with the Nicaragua Canal Commission, until October, when he returned to Washington and reported to Admiral Walker. From that time until June 3 he was engaged in preparing his final report on the geology and physiography of the region adjacent to the canal route and in supplying to the engineers of the Commission data required in making estimates and plans. Since June 3 he has been engaged in work in the southern Appalachians, and is at present occupied in plotting notes upon the topographic bases of the Rome (Georgia), Fort Payne (Alabama), and Anniston (Alabama) sheets.

During the year the following papers by Mr. Hayes on Nicaragua were published: The Physiography and Geology of the Region Adjacent to the Nicaragua Canal Route, in Bull. Geol. Soc. Am., Vol. X, pp. 285–348, pls. 30–32; Physiography of the Nicaragua Canal Route, in Nat. Geog. Mag., July, 1899; The Nicaragua Canal Route, in Science, July, 1899; Report on the Geology and Physiography of the Region Adjacent to the Route of the Proposed Nicaragua Canal, Appendix 2, in Report of the Nicaragua Canal Commission, 1897–1899, 120 pp., 19 pls. Mr. Hayes also published a paper entitled The Copper River as a Route to the Yukon Basin, in Bull. Am. Geog. Soc., Vol. XXX, 1898, pp. 127–134, 2 maps.

Bascom party (Pennsylvania).—Under the direction of Prof. C. R. Van Hise, Dr. Florence Bascom continued the areal mapping of the crystalline rocks for the special Philadelphia folio of the Geologic Atlas, and the field work is now completed. The petrographic study, under the microscope, of the rock specimens collected in mapping the Philadelphia district

is a necessary part of this investigation and has occupied Dr. Bascom in the office. The Philadelphia folio will contain the Norristown, Germantown, Chester, and Philadelphia atlas sheets, on the scale of 1 mile to an inch, with delineation of the distribution of the different kinds of rocks and economic resources, and a descriptive account of both.

Keith party (Maryland, Virginia, District of Columbia, North Carolina, Tennessee).—Mr. Arthur Keith spent four months of the last fiscal year in the field, in detailed work necessary to complete his reports on the Cranberry (Tennessee and North Carolina) and Cherokee (Cherokee County, North Carolina) districts, and to advance toward publication the Washington (District of Columbia), Maynardville (Tennessee, comprising parts of Claiborne, Union, Grainger, Knox, and Jefferson counties), and Cranberry (including parts of Johnson and Carter counties, Tennessee, and of Jefferson, Watauga, Mitchell, and Caldwell counties, North Carolina) folios of the Geologic Atlas. Special study was made of the following phenomena and problems: Folded fault planes and cross faults; the probable age of the Ocoee sediments; a newly discovered series of lava flows and ash beds preceding Cambrian strata in the Abingdon quadrangle; fan structure in the Nantahala quadrangle; variation of lower Silurian sediments from syncline to syncline across the Valley of Tennessee; and metamorphism of igneous formations near Washington and apparent transitions between them.

Prof. H. D. Campbell, of Lexington, Virginia, who had made partial surveys of the Natural Bridge and Lexington quadrangles, was requested to complete them in cooperation with Mr. Keith, and has submitted preliminary drafts of the geologic maps.

Mr. Keith's office work was devoted to the completion of the Washington and Maynardville folios, to the revision of a report on the Cranberry district, and to the preparation of text and maps for the Cherokee, North Carolina, report, in cooperation with the State geological survey of North Carolina.

Van Hise party (Tennessee).—Prof. C. R. Van Hise, in cooperation with Mr. Keith, and assisted by Mr. George W. Stose, assistant geologist, and Dr. Cooper Curtice, paleontologist

visited the Mount Guyot quadrangle, Tennessee, to ascertain, if possible, the relations of the Ocoee series to the Paleozoic rocks of the Great Valley. Mr. Stose made a detailed map of a small area from East Fork to Crosby. Dr. Curtice was occupied in searching for fossils in the Ocoee and in studying the fauna of adjacent rocks. Professor Van Hise devoted his time to studies of the stratigraphy. A detailed report has been submitted to the Director, and has served as a basis for discussion between the several geologists familiar with the question. Although the solution of the problem has been advanced by the exclusion of some hypotheses tentatively held, a final conclusion has not been reached.

ATLANTIC COASTAL PLAIN REGION.

Clark party (Maryland, etc.).—Prof. William B. Clark, State geologist of Maryland, assisted by Messrs. G. B. Shattuck, A. Bibbins, L. C. Glenn, F. B. Wright, and G. C. Martin, continued the investigation of the Cretaceous and Tertiary formations of eastern and southern Maryland. Some time was spent in a study of the extension of the subdivisions of the Potomac in Pennsylvania and New Jersey, to substantiate the Maryland classification. Important results have been obtained in the study of Maryland Neocene formations. Dr. Shattuck has shown, on stratigraphic grounds, the separation of the Neocene into several clearly defined units, and the paleontologic work by Mr. Glenn and Mr. Martin has proved his conclusions. A very exhaustive study of the fauna of the Miocene has been in progress, and a complete monograph on the subject will soon be published under the auspices of the Maryland survey. Some work has also been done upon the stratigraphy and paleontology of the Eocene, while preliminary results of value have been secured from a study of the Pleistocene formations of eastern Maryland.

Professor Clark's work is carried on under a plan of cooperation between the State survey and the United States Survey, in accordance with which the latter will receive for publication in the Geologic Atlas the results of these studies in the Coastal Plain.

*Darton party (District of Columbia, Maryland, Virginia).—*Mr. N. H. Darton, whose chief field of work is now South Dakota, continued in the office the preparation of sheets for the Washington (District of Columbia) folio, one showing the economic resources, including underground waters, and another classifying the physiographic features. Some field work was done to obtain data for the Norfolk (Virginia) folio, covering part of Norfolk County, and the description of that quadrangle has been written.

*Eldridge party (Florida).—*In February, 1898, Mr. George H. Eldridge was assigned to duty in Alaska, and thus his office work on the phosphate district of Florida was interrupted. Since his return he has been engaged chiefly in preparing his Alaskan report. Upon completing that article, in May, he resumed the preparation of the final report on the phosphates of Florida.

INTERIOR OR MISSISSIPPI REGION.

*Van Hise party (Lake Superior region, etc.).—*Prof. C. R. Van Hise, assisted by Messrs. W. S. Bayley, J. Morgan Clements, and C. K. Leith, continued detailed surveys of the iron-bearing districts of Lake Superior. Field work in the Vermilion district was carried on during June, July, and August, and the entire field was covered. Supplementary work remains to be done, however, especially on the ore deposits, in outlining iron-formation areas, and in further studies of general relations of the rocks. Professor Van Hise was occupied during the first half of the field season in general structural studies in the Vermilion district and the adjacent areas of Rainy Lake and Lake of the Woods.

Within the year Professor Van Hise prepared a monograph on metamorphism, the first draft of which is completed. This is a work of profound research, with important bearings on broad scientific problems and questions relating to ore deposits. Prof. W. S. Bayley has in preparation a monograph on the Menominee iron-bearing district, which will not be completed until next year. Mr. J. Morgan Clements was engaged in preparing a monograph on the Vermilion district, and two months were spent in reading proof of Monograph XXXVI, on The

Crystal Falls Iron-bearing District of Michigan. Mr. C. K. Leith was occupied in summarizing North American pre-Cambrian literature. He also began investigation of mineral particles in crystalline schists as bearing upon cleavage.

Professor Van Hise also conducted field work in the Ocoee series of Tennessee (see p. 39), and directed the work of Professor Hobbs in Massachusetts and of Dr. Bascom in Pennsylvania (p. 38).

Darton party (South Dakota, Nebraska).—Mr. N. H. Darton was engaged during the field season in preliminary studies of the stratigraphy of the Paleozoic and Mesozoic formations in the eastern and southeastern portions of the Black Hills, South Dakota. His work is planned to obtain data required by the Division of Hydrography. The Oelrichs quadrangle was mapped, and a reconnaissance was made of the Hermosa quadrangle, extending into the Rapid quadrangle. These cover parts of Fall River, Custer, Pennington, and Meade counties. Progress was made in determining the distribution and depth of sandstones bearing underground water supply.

During the winter office work was done on the maps and text for the Camp Clarke and Scotts Bluff quadrangles, which are to be published as folios of the Geologic Atlas. They comprise parts of Scotts Bluff, Banner, and Cheyenne counties, Nebraska. The Parker and Olivet quadrangles, covering portions of Hutchinson, Turner, Bonhomme, Yankton, and Clay counties, South Dakota, have been completed by Prof. J. E. Todd, under Mr. Darton's general direction.

Hill party (Texas).—Mr. R. T. Hill was engaged during the year principally in office work, chiefly in the preparation of an article on the physical geography of Texas, to accompany a map of Texas which is to appear as a folio of the Topographic Atlas of the United States. The map has now been engraved and the text and illustrations are ready for publication. Mr. Hill also prepared the following papers: The Lower Cretaceous Gryphæas of the Texas Region, published as Bulletin No. 151; Geology of the Edwards Plateau and Rio Grande Plain adjacent to Austin and San Antonio, Texas, with Reference to the Occurrence of Underground Waters, published in the Eighteenth Annual Report, Part II.

The month of January, 1899, was spent by Mr. Hill in a trip to Porto Rico (see p. 55).

Vaughan party (Texas).—Mr. T. Wayland Vaughan was occupied during the entire year in office work, three months being devoted to preparing for publication data accumulated during past field seasons, in part as assistant to Mr. Hill. The manuscript for the text and map of the Uvalde (Texas) folio and a manuscript report on a Reconnaissance in the Rio Grande Coal Fields of Texas were submitted for publication, the latter as a bulletin. Some reconnaissance notes were made on The Geology of the Wichita Mountains, Oklahoma, and Arbuckle Hills, Indian Territory. A short paper was written on The Mode of Occurrence of the Igneous Rocks of the Uvalde (Texas) Quadrangle, as an introduction to a paper by Mr. Whitman Cross on the detailed petrographic characters of the rocks.

An account of work in paleontology done by Mr. Vaughan will be found on p. 68.

Taff party (Indian Territory).—Mr. Joseph A. Taff is engaged in detailed and precise surveys of the coal field of Indian Territory. He was assisted in the beginning of the year by Mr. George I. Adams. The survey of the Atoka and Coalgate quadrangles, in the Choctaw Nation, was completed, and the survey of the Tuskahoma quadrangle was begun, field work being closed in December after a season of seven months. The latter part of the summer was devoted to a review of the geology of the McAlester quadrangle, to determine, if possible, the age of the rocks and to study their structure. In this Mr. Taff was assisted by Mr. George B. Richardson, field assistant, and Dr. George H. Girty, paleontologist.

From December to May all available time was devoted to the preparation of maps of the McAlester, Atoka, and Coalgate quadrangles, for publication as folios of the Geologic Atlas. In May, 1899, Mr. Taff returned to his field of work.

Emmons party (South Dakota).—Mr. S. F. Emmons, assisted by Messrs. George W. Tower, assistant geologist, and T. A. Jaggar and J. M. Boutwell, geologic assistants, was engaged

in investigation of the Black Hills, South Dakota. The areal survey of portions of the northern Black Hills was made by Dr. Jaggar and Mr. Boutwell, and the mapping of the Sturgis quadrangle was completed. This work has been very fruitful in scientific results, the sedimentary rocks presenting representatives of almost all the formations in the geologic column from Algonkian to Tertiary, and the eruptive rocks occurring in laccoliths of varied and typical form and in sills and dikes, and being of interesting petrologic composition, including, among rare types, a variety of phonolite. Dr. Jaggar, assisted by Mr. J. D. Irving, made a reconnaissance to the northwest, into that portion of the hills extending into Wyoming, for the purpose of studying the eruptive phenomena. The economic investigation was undertaken by Mr. Tower, under Mr. Emmons's direction, and together they made special examination of the gold deposits of the Homestake mine, the examination in the area of the Sturgis quadrangle being continued by Mr. Tower.

In the office Dr. Jaggar completed a study of the specimens collected, and prepared the geologic map of the Sturgis quadrangle. It is to be published with the Spearfish quadrangle, which adjoins it, as a folio of the Geologic Atlas. Dr. Jaggar entered upon work in the Spearfish quadrangle late in June.

ROCKY MOUNTAIN REGION.

Emmons party (Colorado).—Under the direction of Mr. Emmons, Mr. George W. Tower investigated the underground workings of mines in the vicinity of Rico, Colorado, being assisted part of the time by Mr. A. C. Spencer, Messrs. Cross and Spencer having completed the areal survey of this district. It is an extremely complicated area, being in a region of great landslides, some of them doubtless of ancient date, which have broken and faulted the ore deposits, especially the veins, so as to render it extremely difficult for the miner to follow them.

Mr. Emmons also made an extended reconnaissance of mining districts in the West, in order to arrive at a better understanding of the relative importance of districts and thus

be able to advise concerning the economic work of the Survey in the future. His observations extended into Montana, Washington, California, Arizona, New Mexico, and Colorado.

In the office Mr. Emmons was occupied in elaborating the notes of his summer's work and in preparing a supplementary report on the Butte mining district of Montana. The Tenmile (Colorado) special folio was completed and published. Mr. Tower had not completed the elaboration of his notes when he accepted private employment, under the agreement that he was to complete the work on his field notes.

A folio of the Tintic mining district of Utah is in course of engraving and will be published in the autumn.

Cross party (Colorado).—Mr. Whitman Cross continued the detailed investigation, in which he has for several years been engaged, of the geology of the San Juan Mountains of southwestern Colorado. He was assisted throughout the year by Mr. A. C. Spencer and during the field season by Messrs. Ernest Howe and Jason Paige, volunteer assistants. The field season lasted from June 1 to November 20, and the time was spent in the areal mapping of portions of the Durango, Engineer Mountain, Silverton, and Rico quadrangles, covering parts of Montezuma, La Plata, Dolores, San Juan, Ouray, and Hinsdale counties, on a scale of 1 mile to an inch, and in a more detailed survey of the Rico mining district. Field work in the Durango quadrangle was completed, except in the extreme southeastern corner. The Engineer Mountain and Silverton quadrangles were studied in reconnaissance. The Rico special area, covering 35 square miles in the Rico quadrangle, is topographically surveyed on a scale of 1:23600, or about 1,950 feet to 1 inch. It embraces the silver-mining district adjacent to the town of Rico, a district of extremely complex structure and numerous igneous intrusions, modified by solfataric action and displaced by landslides, some of which are of great magnitude. Field work was begun on the large-scale special map and carried to such a point by December 15, when further investigations had to be postponed, that it was completed in June, 1899. At the request of Mr. F. H. Newell, chief of the Division of Hydrography, Mr. Spencer spent

about ten days in a geologic reconnaissance of the Montezuma Valley of southwestern Colorado, in order to obtain data bearing on the artesian-water problem.

In the office Mr. Cross prepared the text for the Telluride folio, making it a complete report on the geology of the quadrangle. This is the first folio in which a thorough discussion, as well as a general presentation, of the geology of a quadrangle or district has been attempted. The task of putting the rocks of the Telluride and La Plata collections in permanent shape and the study of rocks collected last season and notes on the same occupied part of the winter. A number of rocks collected in Texas by Mr. Vaughan and in Porto Rico by Mr. Hill were also examined. Mr. Cross served as chairman of the Committee on Analyses of Rocks and of the Committee on Petrographic Reference Collection. Mr. Spencer was engaged, while in the office, in preparing the geologic map and part of the text of the Durango folio.

Hills party (Colorado).—Mr. R. C. Hills completed and handed in, in June, 1899, maps and descriptions of the El-moro, Spanish Peaks, and Walsenburg quadrangles, covering Huerfano, Las Animas, and Pueblo counties, Colorado, for publication in the Geologic Atlas. In this area is exposed the geologic series of rocks from the Archean complex, in the northwestern portion, to the Eocene sediments, on the flanks of the Spanish Peaks. These rocks have been broken through by a series of igneous eruptions of the most interesting types and relations. The region is also of considerable economic importance, as it embraces the Trinidad coal field. The details of the coal deposit and the artesian-water problem are discussed by Mr. Hills.

Weed party (Montana).—Mr. Walter H. Weed was assisted in the field by Mr. L. S. Griswold. General geologic investigations in the Boulder quadrangle were finished, but owing to the shutting down of some mines the report on them is not complete. In July field work was commenced in the Helena quadrangle, a general study of the district being made and some areal mapping done. The detailed work was done in greater part by Mr. Griswold. The Helena area is

especially important because of diversity of topographic and geologic features, and presents a complete epitome of the geology of the mountainous part of the State. Mr. Weed made a reconnaissance trip to the Big Hole Basin, Gibbonsville, Idaho, and the head waters of the Bitterroot River, in company with Mr. Willis, for the purpose of planning future geologic work.

In the office Mr. Weed prepared an elaborate report on The Geology of the Little Belt Mountains of Montana, published in Part III of this Annual Report, with an appendix on the igneous rocks by Prof. L. V. Pirsson, of Yale. Proof of a portion of Part II of Monograph XXXII, on the Yellowstone National Park, was read, and of the geologic maps for the Little Belt Mountains and Fort Benton folios. Work on a report on the geology of Butte, Montana, to accompany that of Mr. Emmons on the ore deposits, occupied some time. The maps of the Boulder quadrangle were prepared for publication. In the study of the ore deposits of this quadrangle the discovery was made that the hot springs of Boulder are now forming mineral veins, furnishing the key to the origin and manner of occurrence of the remarkable reefs of quartz which traverse granite rock in that district. Mr. Weed served as a member of the Committee on Ore and Mineral Analyses.

Hague party (Yellowstone Park, etc.).—Mr. Arnold Hague was occupied during the year entirely in office work, the preparation for publication, reading of the proof, etc., of Part II of the Yellowstone Park monograph (XXXII) occupying most of his time. The text and maps for the Absaroka folio were also prepared, and much time was devoted to the preparation of Part I of the Yellowstone Park monograph. A geologic relief map of Yellowstone Park has been completed, based on the topographic model made by Mr. E. E. Howell.

Dr. T. A. Jaggar made a study of microscopic petrography of the Absaroka Range. The preliminary examinations of the rocks are completed, but the report has not yet been handed in.

Prof. W. A. Setchell, of the University of California, visited the Yellowstone National Park in August, under Mr. Hague's

direction, for the purpose of studying and collecting specimens of hot-water algæ. His report has been handed in and is to be incorporated in Part I of the Yellowstone Park monograph.

Lindgren party (Idaho, Arizona).—Mr. Waldemar Lindgren was assisted in his work in Idaho by Mr. W. A. Pritchard, taking the field in July. The detailed geologic mapping of the mining district adjacent to Hailey, Idaho, was carried out, and a reconnaissance between Boise and Hailey, as well as along Snake River from a point near Weiser to a point west of Salubria, was undertaken, the reconnaissance covering in all approximately 800 square miles.

At the request of the Department of Justice, Mr. Lindgren during part of October made a detailed examination of about 6 square miles adjacent to the town of Oracle, Pinal County, Arizona. The examination was required to determine the mineral or nonmineral character of the land. The report was made at once and transmitted on October 28.

From July 1 to 26, 1898, Mr. Lindgren was engaged in office work in San Francisco, preparing the Colfax folio. This folio, which is one of the most complicated of those examined in the Gold Belt of California, has been completed. A report was prepared on the Silver City and other mining districts for the Twentieth Annual Report. Within the year the Boise (Idaho) folio was published, as well as a report on The Mining Districts of the Idaho Basin and the Boise Ridge, in the Eighteenth Annual Report, and the manuscripts for the Colfax folio were handed in.

PACIFIC REGION.

Branner party (California).—Prof. J. C. Branner prosecuted surveys in the vicinity of Palo Alto, California, in connection with his work as professor of geology at Stanford University, with a view to the ultimate publication of two folios divided by the meridian of 122 and north of latitude 37, comprising parts of Mateo, Santa Clara, and Santa Cruz counties. The topographic maps now available for this work are the Palo Alto, San Jose, and Mount Hamilton 15-minute sheets.

They are to be extended to cover 30 minutes of latitude and longitude for each folio.

The manuscript maps and text for the San Luis folio, submitted by Dr. Harold Fairbanks, under the general direction of Professor Branner, were examined in the field by Mr. Willis, accompanied by Dr. Fairbanks, after conference with Professor Branner. They comprise the Cayucos, San Luis Obispo, Port Harford, and Arroyo Grande 15-minute sheets, in San Luis Obispo County. Additional field work is necessary to an adequate solution of the difficult problems in structure and physiography.

Becker party (California).—Dr. George F. Becker has for many years been engaged in studies of the Mother Lode of California, but during the last year these were interrupted by his transfer to work in the Philippines (see p. 54), and Dr. F. L. Ransome, for a number of years Dr. Becker's assistant, continued the surveys of the Mother Lode, especially with reference to the areal and structural geology. His observations have been platted on the large-scale map of the Mother Lode, and will be published in the Mother Lode folio of the Geologic Atlas, now in process of engraving.

Lawson party (California).—Under the supervision of Prof. A. C. Lawson, about six weeks' field work was done on the Mount Diablo quadrangle, chiefly by his assistant, Dr. G. D. Louderback. Professor Lawson has prepared for publication the geologic maps of the San Mateo, San Francisco, Mount Tamalpais, Concord, and Haywards quadrangles. They are to appear in three folios of the Geologic Atlas, one of which will also contain the Mount Diablo sheet. The geologic maps will be published on the scale of the present topographic maps, 1 mile to an inch. Each folio will contain maps of two 15-minute quadrangles, placed in their relative positions, east and west, thus: (1) Tamalpais, San Francisco; (2) Concord, Mount Diablo; (3) San Mateo, Haywards. These folios will exhibit the geology of the vicinity of San Francisco and a section across the Coast Range, on twice the scale of the usual folio publication.

Turner party (California).—Mr. H. W. Turner organized his

party for field work early in July, with Messrs. W. S. T. Smith, C. E. Knecht, and J. S. Reed as assistants, to carry on geologic surveys in the Sierra Nevada, with special reference to the Yosemite and Mount Dana quadrangles. The mapping of the Yosemite quadrangle was completed, but some revision of the topography is necessary before publication. An excursion was made into the Mount Dana quadrangle to study Lake Tanaya, and for the investigation of certain granites.

In the office Mr. Turner prepared for publication a paper on The Origin of the Yosemite Valley, and the following papers have been written and published: Granitic Rocks of the Sierra Nevada, in *Journal of Geology*; Occurrence of Roscoelite, in *American Journal of Science*; Certain Rock-Forming Biotites and Amphiboles, in *American Journal of Science*; The Occurrence of Diamonds in California, in *American Geologist*; Replacement of Ore Deposits in the Sierra Nevada, in *Journal of Geology*.

Mr. Turner left Washington on March 15, 1899, to make a geologic map of the Silver Peak quadrangle, covering parts of Nevada and California. Up to June 30 about 450 square miles had been covered. The completion of the survey will require about three months' field work in the fiscal year just begun.

Diller party (Oregon).—Mr. J. S. Diller continued his work in southern Oregon, and was assisted by Messrs. A. J. Collier, James Storrs, and G. L. Haskell. Five weeks were devoted to a preliminary survey of the Bohemia mining region, after which a short trip was made eastward to Coal Creek, on the western slope of the Cascade Range, where fossil leaves of Miocene age were collected from tufaceous sandstone. They add another link to the chain of evidence concerning the age of the Cascade Range. The prospects of the Blue River region of the McKenzie were then visited, and several weeks were spent in examining prospects and mines in the Coos Bay coal field, the results of which were incorporated in a paper on The Coos Bay Coal Field, in Part III of the Nineteenth Annual Report. On September 1 work in the Port Orford quadrangle was resumed, and in October a reconnaissance was

made along the coast from Port Orford in Oregon to Crescent City, California, and thence to Roseburg.

In the office Mr. Diller's time was at first devoted to the preparation of a paper on The Bohemia Mining Region, to appear in Part III of this Annual Report. Proofs were read of the paper on the Coos Bay coal field and of the Roseburg folio. A study of the rock of North Carolina bearing the supposed fossil called *Palæotrochis* was undertaken, and an article thereon was published in the American Journal of Science. The manuscript of the Coos Bay folio was nearly completed. Two hundred and fifty nearly full sets of the Educational Series of Rock Specimens were distributed last summer. Mr. Diller served as chairman of the Petrographic Committee and as a member of the Committee on Analyses of Rocks. Messrs. F. C. Ohm and W. S. Robbins were employed in the laboratory, of which Mr. Diller had special charge. Within the year nearly 5,000 thin sections were prepared, 365 specimens cut, and 63 specimens polished.

On June 1, 1899, Mr. Diller resumed work in the Port Orford quadrangle, with the same assistance as the summer before.

Smith party (Washington).—Mr. George Otis Smith, under the general direction of Mr. Bailey Willis, was engaged in detailed work on the Mount Stuart quadrangle, Kittitas County, Washington, but its completion was rendered impossible on account of snow, and field work was stopped October 14. While in the field, during August, Mr. Smith assisted Mr. Tower in preparing the final draft of the geologic maps and sections to accompany the report on the Tintic mining district, published in Part III of the Nineteenth Annual Report, and during the spring, in the office, he read the proof of this report, revised maps and sections for publication in the Tintic Special (Utah) folio, and wrote parts of the folio text. In cooperation with Mr. Willis some work was also done on the maps and text of the Tacoma (Washington) folio. A collection of rocks from the northern Cascades was examined for Prof. I. C. Russell, and a report thereon submitted; and the manuscript of a report on this region by Professor Russell was read and a discussion thereon submitted to Mr. Willis.

Mr. Willis joined Mr. Smith in the Mount Stuart quadrangle and devoted three weeks, between September 7 and October 13, to detailed observations, chiefly on the stratigraphy and structure of the Eocene and later (coal-bearing) strata.

Russell party (Washington).—Prof. I. C. Russell, of Ann Arbor, made a geologic reconnaissance of the northern Cascade Range, Washington. The field work was begun in June and continued to September 20. The route of reconnaissance extended from Clealum up the Wenache River, across Indian Pass and down the Sauk, to the Skagit River. A side trip was made to Glacier Peak. Ascending Skagit River, Professor Russell visited the mining districts about its head waters and recrossed the Cascade Range at Crater Pass. Descending by Methow Valley, he proceeded to Mission, where he disbanded his party. The interesting results gathered in reference to the geology of this little-known region are embodied in an article entitled *A Preliminary Paper on the Geology of the Cascade Mountains in Northern Oregon*, published in Part II of this Annual Report.

ALASKA.

The administrative details of the Alaskan parties are given later under the heading "Topographic branch" (p. 126). Many valuable geologic observations were made, the general results of which are presented in a report prepared in accordance with Public Resolution No. 25 of the Fifty-fifth Congress, third session, approved March 1, 1899, and in the final reports of Messrs. Eldridge, Spurr, Mendenhall, Schrader, and Brooks, contained in Part VII of this Annual Report.

For the field season of 1899 two parties were organized and proceeded to Alaska in April. The first party consisted of Mr. W. J. Peters, topographer, in charge of the party, and Mr. Alfred H. Brooks, assistant geologist. This party was equipped with pack animals and outfit, and, starting from Chilkat Inlet, proceeded along the northern side of the St. Elias Range to the head of White River. It was planned that such exploration as might be feasible should be conducted for the location of the sources of the Copper, Tanana, and Nabesna rivers. If time permitted, the area between the

Tanana and the Yukon was to be surveyed. The main range of mountains is composed largely of gold-bearing schists. It has been very considerably prospected, but little is known of its extent or character. If the party reaches Eagle City, on the Yukon, before the time of the closing of the river, surveys are to be extended to the westward, between the Tanana and the Yukon rivers, by such route as may be found to be feasible.

The second party consisted of Mr. F. C. Schrader, assistant geologist, in charge of party, and Mr. Thomas G. Gerdine, topographer, and was instructed to go down the Yukon to the vicinity of Fort Yukon, to some point well adapted to serve as a base from which to proceed northward toward the Koyukuk River, it being the object of this party to explore the principal waters of the Koyukuk within the Arctic Circle. The region is almost unknown, and discretion was given the chief of party to select such routes as seemed best for the accomplishment of the object of the expedition. It was anticipated that the work would be done mostly along the rivers, use being made of canoes for transportation.

GLACIATED REGION.

Chamberlin party (northern United States).—Prof. T. C. Chamberlin has been privately as well as officially engaged for a number of years in special studies designed to determine criteria for mapping the complex and obscure formations due to the great ice sheets which formerly covered Canada and northern United States. He has been assisted by a number of trained associates, and their observations and conclusions will be presented in several papers; some of these have already been offered for publication by the Survey, while others are in preparation.

During the last year Mr. Frank Leverett made supplementary examinations of glacial formations in Ohio, Pennsylvania, and New York, the results of which he incorporated in his monograph on *The Pleistocene Formations of Ohio and Adjacent Regions*. This monograph is now completed. He revised the manuscript of his report on *The Glacial Lobes of Ohio*, read proof of an article on *Wells of Indiana*, which has been

published as Nos. 21 and 26 of the Water-Supply and Irrigation Papers, and revised the illustrations and read the proof of his monograph (XXXVIII) on The Illinois Glacial Lobe.

Mr. William C. Alden, with the temporary aid of Prof. J. H. Smith, was engaged in work in the Muskego, Milwaukee, and Waukesha quadrangles, in Wisconsin, the detailed mapping of the first two being completed. A report on these districts is in preparation. He was also engaged in preparing a report on the four quadrangles embracing Chicago and vicinity. In May, 1899, work was begun in the southern part of the Port Washington quadrangle.

Mr. T. O. Mabry was from time to time employed in special studies on the loess and associated deposits of Mississippi, and prepared a preliminary report on the results of his investigations in that vicinity.

Besides directing the work of the above assistants, Professor Chamberlin examined a bulletin on the Pleistocene formations of South Dakota by Prof. J. E. Todd, and read proof of Professor Stone's monograph (XXXIV) on The Glacial Gravels of Maine and of Mr. Leverett's monograph (XXXVIII) on The Illinois Glacial Lobe.

WORK IN NEWLY ACQUIRED TERRITORY.

Philippine Islands.

Becker party.—According to an arrangement made with the War Department, Dr. George F. Becker, under orders of July 8, 1898, started for the Philippines, to investigate and report on the mineral resources of those islands. He sailed from San Francisco on the transport *Pueblo* July 15, under General Otis. After reaching Manila, he devoted some time to the preparation of a brief paper entitled Memorandum on the Mineral Resources of the Philippine Islands, compiled from various unpublished records and published memoirs available in Manila and from verbal information furnished by mining men, capitalists, and others. This memorandum was published in Part VI of the Nineteenth Annual Report of the Survey.

In September Dr. Becker spent some days in field work on the island of Corregidor and about Mariveles, where he secured

skeletons of two Negritos, which were afterwards forwarded to the Smithsonian Institution. On his return to Manila he prepared, at General Otis's request, a memorandum on the agricultural resources of the archipelago, which has been sent to the Department of Agriculture. Shortly afterwards, finding it impracticable to pursue further his geologic investigations, he attached himself to the Bureau of Military Information, Eighth Army Corps, under Major Bell. In this position he rendered valuable service, translating from the Manila newspapers articles of importance or interest to the Government and the military authorities, and endeavoring to enlighten public opinion in the islands by published articles correcting Spanish misrepresentations and setting forth the real conditions in the United States, so far as those conditions were likely to become of importance to the Philippines.

After the outbreak of hostilities, upon invitation of General McArthur, to whose staff Major Bell was transferred, Dr. Becker accompanied Major Bell to the front and participated in a number of military reconnaissances and engagements, rendering service that has been favorably reported to the War Department.

In May he made a journey to the island of Negros and endeavored to examine the deposits of Tertiary lignite there, but the hostility of the natives prevented extended investigations. He is at present at Cebu, where he hopes to obtain a sufficiently strong military guard to enable him to examine the lignite of that island.

Porto Rico.

Hill party.—In the month of January, 1899, Mr. Robert T. Hill made a trip to Porto Rico for the purpose of investigating the physiographic and geologic features of the island. He obtained much valuable information concerning the geologic formations and history of the island, and its resources in minerals, forests, agriculture, and water power.

Mr. Hill prepared an article on the Physiography of Porto Rico, published in the National Geographic Magazine, and another on Mineral Resources of Porto Rico, published by the Survey as an advance extract from the Twentieth Annual Report, Part VI. He also prepared A Preliminary Report

upon the Forest and Other Natural Conditions of Porto Rico, to be published by the Department of Agriculture, and a paper entitled A Preliminary Report upon the Geology of Porto Rico is nearly completed.

FIELD AND OFFICE WORK BY MR. WILLIS, ASSISTANT IN GEOLOGY TO THE DIRECTOR.

Mr. Bailey Willis left Washington on July 5, under general orders to confer with geologists in several Western States and to make reconnaissances, especially in western Montana, with a view to planning future geologic work and continuing the surveys in the Cascade Range, Washington (see p. 52). At Chicago a conference was held with Prof. T. C. Chamberlin with reference to publication of the results secured by the section of glacial geology.

At Helena, Montana, on July 11, Mr. Willis joined Mr. Walter H. Weed, with whom several trips were made during the remainder of the month. These journeys comprised an examination of the surveys already accomplished by Mr. Weed in the Boulder and Helena quadrangles, and a visit to the Elkhorn mining district, east of Boulder, to determine the desirability of making a large-scale topographic map and an economic geologic survey. A reconnaissance trip was also made from Butte, Montana, up the Big Hole Valley to Wisdom, across the mountains to Gibbonsville, Idaho, thence north into the Bitterroot Valley, and thence via the Trail Creek Pass and Big Hole Valley to Anaconda. In August Mr. Willis made a reconnaissance in the mountains between Phillipsburg and the Bitterroot Valley, in the Bitterroot Mountains near Hamilton, and in the Mission Range in the vicinity of St. Ignatius, Montana. General observations were made on the geology and physiography of western Montana, and special reports were submitted.

On September 18 and 19 conference was held with Prof. I. C. Russell, who had just returned from a trip in the northern Cascades, and Mr. George Otis Smith, at Mission, Washington. Three weeks were spent with Mr. Smith's party in special studies of the coal-bearing formations of the Mount Stuart quadrangle.

A week was given to editing the text of certain geologic folios that were ready to be published.

Proceeding via Tacoma, Washington, and Portland and Roseburg, Oregon, Mr. Willis spent three days with Mr. Diller in the Roseburg quadrangle, studying the relations of the Cretaceous, Eocene, and igneous rocks of that district, and reached San Francisco on October 21. During the ten days following, conferences were held at Jamestown with Mr. Ransome, who was studying the Mother Lode; with Professor Lawson at Berkeley, with reference to the publication of the folios pertaining to the vicinity of San Francisco; and with Professor Branner at Palo Alto, in regard to the geology of the Coast Range in this district. A trip occupying several days was made with Professor Branner into the mountains south and west of Palo Alto. On November 2 Mr. Willis was joined by Dr. H. W. Fairbanks and Mr. Ransome, and proceeded to San Luis Obispo, where four days were spent in an examination of the geology of the San Luis Obispo district, with special reference to the surveys already accomplished by Dr. Fairbanks. He next proceeded to Indian Territory, to consult with Mr. J. A. Taff, who was studying the structural geology of the Paleozoic coal-bearing formations.

From the time of his return to the office in November to the close of the fiscal year Mr. Willis was largely occupied with administrative duties and in examining manuscripts submitted for publication, including texts for folios of the Geologic Atlas. He held conferences with geologists on the preparation of plans for the field season of 1899, including consideration of several routes of exploration in Alaska, and served as a member of the Committee on Analyses of Ores and Mineral Waters, the Petrographic Committee, the Committee on Petrographic Laboratory, and the Committee on Educational Series of Rocks. He also prepared the maps and text of the Tacoma (Washington) folio, in collaboration with Mr. George Otis Smith; an article on The Rainier Forest Reserve, which appeared in "The Forester" for May, 1899; and a summary of Paleozoic Appalachian history, to be published as a preliminary chapter to a report of the Maryland geological survey.

FIELD AND OFFICE WORK BY THE DIRECTOR.

The field work of the Director was confined mainly to an examination of the Teton Forest Reserve, in Wyoming, and a geologic reconnaissance of the Belt Mountain area east of Helena, Montana.

In August, accompanied by Mr. F. B. Weeks as secretary and field assistant, he went with a camp outfit from Livingston, Montana, up the Yellowstone River to and across the Yellowstone National Park, entering the Teton Forest Reserve by the Snake River Valley. The result of the examination of the reserve and the area to the south is given in the following report made to the Secretary and forwarded to Congress on December 12, 1898:

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., December 12, 1898.

SIR: I have the honor to acknowledge the receipt, by reference from the Department, of a copy of a Senate resolution adopted December 6, 1898, calling for information in relation to the region south of and adjoining the Yellowstone National Park, the resolution being in the following words:

Resolved, That the Secretary of the Interior be, and is hereby, directed to send to the Senate all the information in the possession of his Department in relation to the region south of and adjoining the Yellowstone National Park; also what steps should be taken to preserve the game in the park, and whether the region south of the park should not be put under the same control as the national park, in order to prevent the extinction of the herds of wild game roaming therein.

In conformity with the instructions contained in your indorsement, I have the honor to submit the accompanying report in duplicate.

I am, with respect,

CHAS. D. WALCOTT, *Director.*

The SECRETARY OF THE INTERIOR.

REPORT ON THE REGION SOUTH OF AND ADJOINING THE YELLOWSTONE NATIONAL PARK, WITH ESPECIAL REFERENCE TO THE PRESERVATION AND PROTECTION OF THE FORESTS AND THE GAME THEREIN.

In accordance with the instructions of the honorable the Secretary of the Interior, I visited, during the field season of 1898, the Teton Forest Reserve, and also examined the country lying to the south of that reservation. In making the examination the valley of Jackson Lake and the Snake River were followed to the Lower Gros Ventre Butte, and an ascent was made of the northern portion of the Teton Range, the Gros Ventre Range below Jackson post-office, and the higher ridges in the eastern portion of the reservation south of Buffalo River. From several main peaks practically the whole of the reservation was seen.

The Teton Reserve includes the northern portion of the Teton Range, the valley of Jackson Lake, and the mountain ranges about the headwaters of Buffalo River and north of Gros Ventre River. There is very little commercial timber within this area, owing to the fact that it has been in the past persistently burned by the Indians. All over the region young pines are springing up, and in a few years there

will be a heavy forest growth over a large portion, provided fires are kept out of it. At the west foot of the Teton Range, in the western portion of the reserve, there is a small area of valley land of considerable elevation—7,000 to 8,000 feet—and in the interior of the reserve is a large valley about Jackson Lake, also greatly elevated, its elevation ranging from 6,000 to 7,000 feet. The great elevation of these areas renders them of little value for agricultural purposes, since nothing but the hardiest vegetables can be cultivated successfully, and the areas valuable for hay are limited.

Recommendations.—I would not recommend that any part of the present reserve be taken from it, unless it be a little of the valley land on the western border. Even this, under the present law, can be settled upon and taken from the reserve upon proof of its agricultural character. The same is true of the valley land in the vicinity of Black Tail Butte, on the southern edge of the reserve.

The extension of the reserve to the south is very desirable, both in order to secure natural fire limits and to provide a winter range for the elk, antelope, and deer which have their summer range in the Yellowstone National Park. Much of the region lying to the south of the reserve is mountainous, covered with a scanty growth of timber, but capable of supporting a heavy forest growth if protected from fire. The only agricultural land within a distance of 18 miles south of the present limits of the reserve is in the valley of Snake River, the Little Gros Ventre River, and the main tributaries entering into it from the east, where there is sometimes an acre or two of agricultural land. The same is true of the valley of the Gros Ventre River, where there is some agricultural land for a distance of 3 miles along the east base of Black Tail or Upper Gros Ventre Butte. This is of essentially the same character as the hay lands of the lower portion of the Buffalo River Valley.

I have examined the reports of the agents sent to investigate the distribution of the forests of the Teton Reserve, and recommend that, if the region is to be kept as a forest reserve, the present eastern boundary of the Teton Reserve be extended south to the south line of township 39, and that its south line be the south boundary of township 39, running westward as far as the southwest corner of township 39, range 117 west. I also recommend that the following fractional townships, 43 and 44 north, range 118 west, be withdrawn from the Teton Reserve and restored to the public domain.

If a Teton national park is to be established, I recommend that it include all of the present Teton Forest Reserve, with the exception of fractional townships 43 and 44 north, in range 118 west, and that portion of the Yellowstone Timber Land Reserve lying south of the Yellowstone National Park, and also the following-described area lying south of the Teton Forest Reserve: Townships 39, 40, 41, and 42 north, in ranges 110, 111, 112, 113, and 114 west.

If such additions are made to the park, it would be absolutely necessary that a strong, durable wire fence be constructed to run from the base of the Teton Range on the west to the canyon of the Gros Ventre River on the east, a distance of 18 miles, in order to prevent the game from following down the Snake River Valley into the settled districts in the Jackson Hole country.

Protection of game.—At present the game is protected in the Yellowstone National Park, and a perfect summer range is provided for it. But as winter approaches the elk, deer, moose, and antelope seek a winter range at a lower altitude or they perish. Some of the animals work off to the northeast corner of the park and winter there, but the greater number descend to the south to the Jackson Lake Basin and along to the hills and mountains to the east of the lake. Later in the fall and early in the winter heavy snow gradually drives the game south down the Snake River Valley and the mountain slopes to the east and west.

Formerly many of the elk and deer ranged as far down as 30 or 40 miles south of the Gros Ventre Butte, but with the settlement and fencing in of the bottom land, the cropping of grasses, and pasturing of cattle and sheep their winter pasture has been gradually crowded to the northward. Now it is only a question of a few years

before the winter range will all have been taken, and the game will have followed the buffalo and other large game of Colorado and other sections of the Rockies and the Sierra and Coast ranges and become extinct.

The Government is now brought face to face with the question, Shall it protect the winter range of the game which it has at large annual expense protected in its summer range in the Yellowstone Park? It owns and controls most of the lands of the winter range. Will it continue in this control, or will it give the lands up to the pasturage of cattle and sheep, and thus exterminate the game? In September and October of the present year parties were camped on nearly every creek in the large region south of the park, waiting to shoot down the game, which they can freely do under the game laws of Wyoming, which license the hunting of large game three months each fall. Will the Government prevent the shooting of game within the Yellowstone Timber Reserve and the Teton Forest Reserve? If it does not, the rifle and shotgun will as surely exterminate the game as will the destruction of their winter pasture.

Annexation of the region south of the Yellowstone National Park to that park.—The area south of the park, extending as far as Black Tail Butte, or the southern limit of the present Teton Reserve, should either be added to the Yellowstone National Park or constituted as a separate park, to be known as the Teton National Park.

I have personally visited most of the points and regions in the United States noted for their scenery, but in my judgment there is nothing that excels in natural beauty the valley of Jackson Lake and the Teton Mountains. The Tetons are unequaled except in the higher, almost inaccessible points of the Sierra and Cascade mountains, and Jackson Lake is a beautiful sheet of water lying directly at their base. It may be more truly called the Switzerland of America than can any other spot known to me. If it were practicable to obtain railroad facilities to the foot of Jackson Lake and thus enable the tourist to see that beautiful region and then go north by stage to the Yellowstone Lake and through the park, it would be the grandest trip, for one of limited extent, to be found anywhere in the world.

Settlers.—The question of the rights of settlers that are always to be found within the Teton Reserve and the region to the south can probably be adjusted under the present law, through the General Land Office, without injustice to these settlers. If not, the action of Congress can be invoked, inasmuch as the preservation of the wonderful scenery of this country and the great natural forest areas is a subject of importance to the American people.

On the return trip the older sedimentary formations of the Teton Range were examined and a collection of fossils was made from the Cambrian rocks. This study was also continued late in October in a northern spur of the Wasatch Range near Malade, Idaho.

Early in September a camp outfit was obtained at Bozeman, Montana, and a study of the Belt Mountain series of rocks was begun. From the time of the Hayden survey of this region there had been differences of opinion as to the correct stratigraphic position of a series of shales, sandstones, and limestones, 10,000 feet or more in thickness, that form the Big and Little Belt mountains. By studying and measuring a number of local sections and one crossing from Helena to Neihart, data were obtained which showed that the Belt Mountain forma-

tions were unconformably beneath the Cambrian rocks; also that they contain the oldest traces of highly organized animal life known.

On the return trip short stops were made at Butte, Malade, Cheyenne, and Omaha.

The general administrative work of the Survey and the consideration of questions that arise from day to day occupied most of the Director's time. As opportunity offered, a paper was prepared on the results of the reconnaissance in Montana, and the study of the Cambrian Brachiopoda was continued.

On returning from the field Mr. Weeks resumed work on the card catalogue of geologic formation names; this he continued until February 1, 1899, when he took up the preparation of his annual bulletin—A Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for 1898. This work was completed and forwarded to the Director on June 30, 1898. It is now in the printer's hands and will be published soon.

In the office work of the year the Director had the assistance of Miss Jean F. Kaighn, confidential clerk, and of many others in the Survey as occasion required.

DIVISION OF PALEONTOLOGY.

As in previous years, several of the paleontologists were engaged in procuring paleontologic evidence to assist geologists in the determination and correlation of the various geologic formations. The work of the paleontologist frequently borders so closely on that of the geologist as to render treatment under a separate head scarcely possible.

Girty party (Carboniferous).—Dr. George H. Girty was occupied during the field season of 1898 in continuing the collection of fossils and the study of the Lower Carboniferous formations of Ohio and Michigan. In the fall he spent six weeks with Mr. J. A. Taff in Indian Territory for the purpose of assisting, through his knowledge of the fossil faunas, in the solution of several problems presented by the complicated stratigraphic geology of the McAlester quadrangle, in the Indian Territory coal field.

In the office Dr. Girty made a preliminary study of the material collected in Indian Territory and submitted a report to Mr. Taff. A study was made of all accessible material from the Devonian and Carboniferous formations of Colorado, and a report thereon was submitted to Mr. Cross. A report was also made to Mr. Emmons on the collections from the Carboniferous rock of the Black Hills of South Dakota, and several brief reports on Upper Paleozoic fossils were made to various members of the Survey. Dr. Girty also assisted the Director in the preparation of material for a monograph on Cambrian Brachiopoda.

Williams party (Devonian).—Prof. Henry S. Williams continued the general study of the Devonian rocks and faunas. During the previous year this work was mostly in Aroostook County, Maine. The last year it consisted chiefly in elaborating the fossils and studying all the faunas involved and their relations. These investigations called for a comparison with Lower Helderberg and Oriskany faunas of other regions, and Mr. E. M. Kindle was sent into southern Kentucky, Virginia, and West Virginia to examine the interval from Silurian to Carboniferous and collect the faunas. Mr. Kindle spent about two months in the field and then returned to New Haven, and during the year was employed in putting the collections in order and identifying the fossils tentatively. A preliminary report announcing the composition of these faunas is nearly ready for publication.

In the laboratory photographs by a new method were prepared after some experimentation, and over 200 figures proved satisfactory. A report was also prepared of the Arkansas collections originally made to assist Dr. J. C. Branner, as State geologist of Arkansas. The geologic results had been reported to him, but the paleontologic facts have not yet been published. These reports are nearly ready for publication so far as the manuscript is concerned, and the illustrations for the Maine report are well advanced.

In addition to these paleontologic investigations Professor Williams continued the study of the igneous rocks and their relation to the stratigraphic series in Aroostook County, Maine.

He sent Mr. H. E. Gregory into the field for the purpose of extending his observations and enlarging his collections, and Mr. Gregory has prepared a report, being aided by Prof. L. V. Pirsson in the study of petrographic problems.

At the request of the Director, Professor Williams sent to Washington a large number of Carboniferous collections, mainly from Missouri and neighboring States, for further elaboration by other officers of the Survey, and his general field of work has been restricted to the Devonian.

Stanton party (Cretaceous).—Mr. Timothy W. Stanton was engaged, in field and office, in the study of the Cretaceous formations and their contained faunas. During the summer of 1898 he was in the field in El Paso County, Texas, studying the Mesozoic strata of the region around Sierra Blanca and examining portions of the Fort Hancock, Sierra Blanca, and Eagle Mountain quadrangles, including the Finlay, Malone, Sierra Blanca, and Quitman mountains, the northwestern part of Eagle Mountains, and the intervening valleys and hills from a few miles north of the Southern Pacific Railway to the Rio Grande. In the course of this work the stratigraphic succession of the Cretaceous section, which had been confused and was perplexing, was satisfactorily made out, and collections of fossils were obtained from the different horizons. Several new fossiliferous localities were discovered in the Jurassic beds in and near Malone Mountain, and considerable additions were made to the Jurassic fauna collected in this region by Prof. F. W. Cragin and Mr. Stanton in 1897. He next went to El Paso and spent two days in studying the upper part of the Cretaceous section on the Rio Grande for miles above that place. Kent, a station on the Texas and Pacific Railway in eastern El Paso County, was next visited, and a week was spent in studying and collecting fossils from the Cretaceous beds near that place. He then went to Shumla, near the mouth of Pecos River, and spent four days collecting from the fine cliff exposures of Pecos Canyon, and on the Rio Grande at Painted Cave, which is just below the mouth of Pecos River.

On August 27 Mr. Stanton started for Belvidere, in southern Kansas, where Prof. L. F. Ward and party soon joined him,

and together they studied the stratigraphy of the Comanche series and overlying Dakota beds in southern and central Kansas. After visiting the principal exposures in the neighborhood of Belvidere the party went to Spring Creek, near the head of Medicine Lodge River, where the higher beds are better exposed, thence by way of Coldwater to Ashland and up West Bear Creek about 10 miles, where a camp was established, and studies and collections were made at many exposures in the surrounding country. On September 17 the party started for the Dakota area in the vicinity of Ellsworth and Salina, going by wagon road to Ford, on the Arkansas, thence through Kinsley, Larned, Pawnee Rock, and Great Bend, to Ellinwood, and northward to Ellsworth. During the remainder of the month they studied the Cretaceous exposures between Ellsworth and Salina and near the latter place, collecting invertebrates from the Benton limestone, plants from several horizons in the Dakota, and invertebrates from the underlying Mentor beds, which have only recently been separated from the Dakota. Their field work in Kansas shows a very close stratigraphic connection between the Dakota leaf-bearing sandstones and the underlying marine beds of the Comanche series. On the return Mr. Stanton stopped at Lawrence, Kansas, to examine the Cretaceous collections of the State University.

In the office Mr. Stanton continued the study of the Lower Cretaceous faunas of the Texas region, which has been in progress for some time. The collections obtained in 1898 were large and important, adding a number of new species to the faunas, besides furnishing better material of many species that were partially known. The preparation, classification, and preliminary study of these collections occupied the time for several weeks before descriptive work could be resumed. Considerable progress was made during the year in the description of species for a proposed monograph on the Lower Cretaceous, and about 250 drawings and photographs are completed for its illustration. A number of reports were made on collections referred for examination, mostly collected by members of the Survey, with a few sent in by correspondents of the National Museum.

Since January Prof. F. W. Cragin, of Colorado College, now studying at Johns Hopkins University, has been working at intervals, under Mr. Stanton's supervision, on the description of the Jurassic fauna discovered by him near Malone, Texas.

In April Mr. Stanton was detailed to visit Chapel Hill, North Carolina, in order to examine the fossils in a large series of samples obtained by Prof. J. A. Holmes from the deep well recently bored at Wilmington. This resulted in determining the Upper Cretaceous age of the 1,100 feet of sediments penetrated by the well.

Ward party (Cretaceous).—In August Prof. Lester F. Ward, accompanied by Mr. C. N. Gould as assistant, began the study of the relations of the Comanche terrane to the Dakota terrane. Mr. T. W. Stanton joined the party at Belvidere, so as to take charge of the collecting of the fossil fauna, while Professor Ward looked after the fossil flora. The general course of the party is outlined above in the account of Mr. Stanton's work. Large collections of fossil plants were made by Professor Ward and Mr. Gould, at what were considered critical points in the stratigraphy, great care being taken to study the stratigraphic relations of all the material collected. Early in October Professor Ward left Mr. Gould in charge of collecting and went to Sturgis, South Dakota, to make further studies of the geology of the cycad-bearing strata. The results secured were of value and were incorporated in a paper in the Nineteenth Annual Report, Part II, entitled The Cretaceous Formation of the Black Hills as indicated by the Fossil Plants.

In the office Professor Ward was engaged in unpacking and arranging the types of the several collections from the Shasta group of California, including those made by him in 1895, all of which have been through Professor Fontaine's hands and are named and described in a manuscript which was submitted by the latter more than a year ago, together with the specimens, which had never been unpacked. On November 22 Professor Ward proceeded to New Haven to examine the collections of cycads that Professor Marsh had received from South Dakota. He found them extensive, and was engaged for eight days in their study. In January he commenced

gathering data for a paper on the Status of the Mesozoic Floras of the United States, which is now nearly completed, and will be published in Part II of this Annual Report. The correction of proof of the paper on the Cretaceous of the Black Hills occupied considerable time during the months of February, March, and April. In March a large collection of Jurassic cycads was received from Mr. W. C. Knight, State geologist of Wyoming, and their study was at once begun.

In August Prof. W. M. Fontaine visited Williams College, Williamstown, Massachusetts, and carefully examined the collection of Triassic plants made long ago by Dr. Ebenezer Emmons, and now in the museum of that college, in charge of Dr. T. Nelson Dale. A few of the types that needed special attention and illustration were loaned to the Survey and sent to the University of Virginia, where Professor Fontaine described them and prepared a full report on the collection.

A collection made by Mr. Atreus Wanner in the Triassic beds near York, Pennsylvania, was examined by Professor Fontaine, and he has submitted extended notes on the same and on the manuscript and drawings of Mr. Wanner that accompanied them. Both of these reports of Professor Fontaine, and also Mr. Wanner's paper as a whole, are embodied in Professor Ward's paper on the Status of the Mesozoic Floras of the United States, mentioned above.

Miss Lottie Schmidt accomplished a large amount of work on the Bibliography of Paleontology during the year. A rough estimate shows that the number of titles that it now contains does not fall short of 15,000, and it might be still more roughly estimated that the total number will somewhat exceed 20,000.

Knowlton party (Cretaceous).—Early in July Prof. F. H. Knowlton joined the party of Prof. I. C. Russell and Mr. George Otis Smith at Clealum, Washington. After studying the formations and collecting a series of fossil plants along the eastern base of the Cascade Range, he crossed the range to study the formations and make collections of fossil plants in the vicinity of Burnett, Carbonado, Wilkeson, Newcastle,

Renton, Franklin, Black Diamond, and Black River Junction, Washington. The collections give the first definite proof of the similarity in age of the formation on the eastern and western sides of the Cascade Range in this region. In September Professor Knowlton visited the vicinity of Whatcom, and then returned to the office. In the office the collections from Washington were unpacked, and their study was continued, with few interruptions, until the close of the fiscal year. Over 130 species of plants were identified and described as the beginning of a monograph on the fossil flora of the Puget formation.

The following reports were made on collections of fossil plants submitted to Professor Knowlton: (1) Small collections from Texas, to Prof. R. T. Hill; (2) a collection obtained in Alaska, to Mr. J. E. Spurr; (3) a small collection obtained from the Copper River district, Alaska, to Mr. F. C. Schrader; (4) a collection from Coal Creek, Oregon, to Mr. J. S. Diller; (5) a preliminary report on a collection from the vicinity of Winthrop, Methow Valley, northern Cascade Mountains, Washington, to Prof. I. C. Russell; (6) a collection from the vicinity of Porcupine Butte, Montana, to Mr. W. H. Weed; (7) a collection from Durango, Colorado, to Mr. Whitman Cross; (8) a report on the fossil plants of the Puget formation and their significance, to Mr. Bailey Willis for use in his Tacoma folio; (9) a preliminary report on a collection from western Nevada, to Mr. H. W. Turner.

A paper on the Fossil Plants of the Lavas of the Cascade Range in Oregon was prepared for Part III of this Annual Report, and proof of a paper on the Fossil Flora of the Yellowstone National Park, published in Part II of Monograph XXXII, was read and corrected during the winter.

Dall party (Tertiary).—The field work of Dr. William H. Dall was limited to the early part of the field season of 1899, when he went to the coast of Alaska as a member of the Harriman expedition. Mr. Frank Burns made a short collecting trip to Plum Point, Maryland, under Dr. Dall's instructions.

In the office Dr. Dall continued his monographic work on the Tertiary faunas. It is hoped that another year's work will complete the revision of the Oligocene, Miocene, and Pliocene

faunas of the Atlantic and Gulf coast Tertiary. In addition, the usual routine work was attended to. This included giving information by report or letter to 125 individuals. Mr. Burns was engaged in sorting, cleaning, and registering Tertiary fossils, and Mr. Vaughan in critically working over the Eocene fossils for the purpose of preparing a reference study series.

Several months were spent by Mr. Vaughan in assisting Dr. Dall in the section of Cenozoic invertebrate paleontology at the National Museum. A portion of his time was devoted to the study of fossil coral faunas, but the greater portion was spent in studying the Survey collection of Eocene Mollusca. Mr. Vaughan completed and transmitted for publication a monograph on the Eocene and Lower Oligocene Corals of the United States, and wrote three shorter papers on fossil corals: Some Cretaceous and Eocene Corals from Jamaica, written for Mr. Hill; Corals of the Shoal Creek Limestone of Texas, written for G. B. Shattuck, and to be published in a bulletin of the Survey; and Jurassic Corals from Texas, written for F. W. Cragin, and to be published in a bulletin of the Survey.

Marsh party (vertebrate paleontology).—Prof. O. C. Marsh continued the study of the vertebrate collections in his charge as well as his failing health would permit. He died suddenly on March 18, 1899. Arrangements have been made with the trustees of the Peabody Museum, New Haven, to have all collections and property of the Government packed and forwarded to Washington, the authorities of the United States National Museum to take charge of the packing and removal. Accordingly, Mr. F. A. Lucas began the packing in May, and before June 30 more than two carloads were ready for shipment. A full report will be given a year hence.

DIVISION OF CHEMISTRY.

During the fiscal year 1898–99 the work of the Division of Chemistry was continued under the charge of Prof. F. W. Clarke, who was assisted by Dr. W. F. Hillebrand, Dr. H. N. Stokes, and Mr. George Steiger. In the ordinary course of routine work 295 analyses were reported, and these covered the usual ground. Rocks, ores, minerals, coal, waters, etc., have

been examined in considerable variety, in accordance with the needs of the geologists.

For about a month in the autumn of 1898 Professor Clarke was on duty at the Trans-Mississippi Exposition in Omaha, where the Survey had a small exhibit. Apart from that work his time was occupied to some extent with chemico-mineralogic researches, in which he had the assistance of Mr. Steiger. The results of one investigation, on the relative solubility of various rock-forming silicates in water, have already been published, and those of another, on the chemical constitution of pectolite, pyrophyllite, calamine, and analcite, are now ready for the press. In the case of analcite, results of unusual interest were obtained, which open a practically new field for mineralogic investigation.

By Dr. Hillebrand a number of very rare mineral species—tysonite, bastnasite, roscoelite, melonite, and carnotite—were studied and analyzed, and their composition, hitherto very uncertain, has been determined.

Dr. Stokes began a research into the constitution of the silicic acids, but his time was so taken up by routine analytical work that he has as yet made very little progress with the problem. The questions which he is seeking to answer are of fundamental importance in geologic chemistry, and it is to be hoped that more time will be available for his researches during the coming year.

DIVISION OF HYDROGRAPHY.

This division was continued in charge of Mr. Frederick H. Newell, whose assistants in the various subdivisions of investigation were Messrs. Arthur P. Davis, Willard D. Johnson, N. H. Darton, Cyrus C. Babb, H. A. Pressey, Gerard H. Matthes, and Edwin G. Paul. In addition there were employed in the field a number of specialists, designated resident hydrographers, whose names are given below in connection with the work in various localities.

Mr. Arthur P. Davis had charge of the investigation of the practicability of storing water along Gila River for the purpose of irrigating the Gila River Indian Reservation. This

work was carried on in accordance with a provision in the act making appropriation for current and contingent expenses of the Indian Department, etc., approved July 1, 1898. During the early part of the year Mr. Davis was in Nicaragua, having been detailed to the Nicaragua Commission, under the Department of State, to take charge of hydrographic investigations in Nicaragua. He returned to the United States in October and made arrangements for sending two sets of drilling machinery to The Buttes, in Arizona, for use by experienced men formerly employed on similar work in Nicaragua.

Mr. Cyrus C. Babb was detailed to assist Mr. Davis, and under his direction made a general reconnaissance of the Gila River for the purpose of ascertaining the feasibility of the construction of a dam at The Buttes and the limitations resulting from the use of water for storage at higher points.

Mr. Willard D. Johnson continued his studies of the Great Plains area and prepared a portion of a manuscript to be published as a monograph on the High Plains. This discusses the origin and structure of the High Plains, the ground water, methods of pumping or bringing this water to the surface, and other matters of scientific interest and practical value.

Mr. N. H. Darton continued systematic examination of the region to the east of the Black Hills, in South Dakota, bordering on the Bad Lands. He has made a general study of the underground conditions as affecting the availability of water from artesian or other wells, and in addition to his general studies made a detailed examination of the Hermosa quadrangle, with the object of ultimately preparing a folio of the Geologic Atlas. The work in South Dakota was also continued in the eastern part of the State by Prof. James E. Todd, who made an examination of the Olivet and Parker quadrangles, sufficiently detailed to show on maps, by suitable colors or contour lines, the depth to the water-bearing horizons.

Mr. H. A. Pressey was engaged in the compilation of material for Part IV of the Twentieth Annual Report and in establishing stream measurements in Ohio.

Mr. Edwin G. Paul had charge of the instrumental equipment and the rating of meters, and in addition carried on field work in Pennsylvania and Maryland.

Mr. Gerard H. Matthes, under the personal direction of Mr. Newell, made detailed surveys of reservoir sites in southwestern Colorado by means of which it was thought to be practicable to supply water to the southern Utes. This work was carried on under instructions from the Secretary of the Interior, dated July 15, 1898, being in accordance with a provision in the act making appropriations for the current and contingent expenses of the Indian Department, approved July 1, 1898.

In addition to the special investigations above enumerated field work was carried on in a manner similar to that outlined in the Eighteenth and Nineteenth Annual Reports, the area under investigation being extended wherever opportunity offered. In the allotment of funds the work of stream measurement received, as in the past, over one-half of the total amount. Of the remainder, about one-half was devoted to the investigation of underground waters and artesian wells, and the balance to the preparation of reports on the best methods of utilizing the water supply. The results are shown in the accompanying volume on hydrography (Part IV) and in the series of Water-Supply and Irrigation Papers, thirty of which have now been published. The following description of field work carried on in various parts of the country is arranged, as in previous years, in a general geographic order, as follows: First, the humid region, or eastern half of the United States; next, the sub-humid region, which is somewhat arbitrarily assumed to include the States from South Dakota to Texas; and finally the arid region, embracing the greater part of the Western States and Territories.

HUMID REGION.

New England.—A study of the hydrographic data for southern New England was continued by Prof. Dwight Porter, the results being similar in form to those printed in the Nineteenth Annual Report, Part IV.

New York.—Measurements of streams issuing from the western and southern portion of the Adirondacks were begun during 1898 by the United States Board of Engineers on Deep Waterways, the work being under the charge of Mr. George W. Rafter, assistant engineer. About twenty river stations

were established, and the expense of beginning the investigations was borne by that board. It was found, however, that these stations could not be maintained through a complete year, and on May 1, 1899, this Survey assumed the expense of paying observers. The results obtained will have considerable value in the study of hydrography in this part of the country.

Pennsylvania.—In this State measurements were extended along the Susquehanna River and its tributaries and also on the Delaware River.

Maryland.—Prof. William B. Clark, State geologist, continued to render effective assistance in the maintenance of river stations. A reconnaissance was made in Allegany County, and the results were prepared for publication in one of the volumes of the State geological survey.

Virginia and West Virginia.—River stations were maintained in these States, the work, except in the case of the Shenandoah and its tributaries, being carried on by Prof. D. C. Humphreys, of Lexington, Virginia.

North and South Carolina.—Prof. J. A. Holmes, State geologist, continued active cooperation, the field work being done by his assistant, Mr. E. W. Myers.

Georgia, Alabama, and Tennessee.—Prof. B. M. Hall, of Atlanta, Georgia, with the aid of his brothers, energetically carried on river measurements in these States, extending the work wherever practicable. He cooperated with the State geologist of Georgia, Prof. W. S. Yeates, and the State geologist of Alabama, Prof. E. A. Smith.

Ohio.—Measurements of Sandusky and Maumee rivers and of the Scioto and Olentangy were made through cooperation with Dr. C. O. Probst, secretary of the State board of health, and Prof. C. N. Brown, of the Ohio State University.

Indiana.—The results of field work in Indiana were prepared by Mr. Frank Leverett and published as Water-Supply and Irrigation Papers Nos. 21 and 26.

Michigan.—Dr. Alfred C. Lane, State geologist, continued the collection of data relating to the wells of Michigan, a portion of the results being printed as Water-Supply and Irrigation

gation Paper No. 30. Manuscript for later numbers of that series is in hand.

Mississippi Valley.—Data concerning the larger rivers of the Mississippi Valley were obtained by correspondence with the Corps of Engineers, United States Army, and from Hon. Willis T. Moore, Chief of the Weather Bureau. These data were compiled for use in connection with discussions particularly of the regimen of the head-water streams.

SUBHUMID REGION.

North Dakota.—In this State Prof. Earle J. Babcock, of Grand Forks, continued his work upon compiled data concerning the wells, particularly of the eastern part of the State.

South Dakota.—Mr. N. H. Darton, geologist, studied the artesian conditions in the region just east of the Black Hills, as described on page 42. The work in the James River Valley was continued by Prof. James E. Todd, as already noted (p. 42).

Nebraska.—River measurements in this State were continued, under the direction of Prof. O. V. P. Stout, by his assistant, Mr. Glenn E. Smith. Work was also maintained at North Platte by Mr. Charles P. Ross. Prof. Erwin H. Barbour, State geologist, prepared a paper on Wells and Windmills in Nebraska, which is in press as Water-Supply and Irrigation Paper No. 29.

Kansas.—Mr. W. G. Russell continued stream measurements in the central portion of the State, and Prof. E. C. Murphy carried on work at Lawrence and on the Neosho and Verdigris rivers.

Texas.—Prof. Thomas U. Taylor, of Austin, made further stream measurements, covering several of the more important rivers of the State.

ARID REGION.

As in past years, the greater part of the funds available were devoted to the arid region, where over two-thirds of the land is still in the hands of the General Government. Stream measurements were systematically made at various localities and data were obtained concerning losses and gains through

evaporation and seepage. A number of reservoirs were surveyed and estimates of the cost of water conservation were brought together.

Arizona.—A large amount of data was acquired concerning the Gila River and its tributaries, and estimates of the cost of water storage were prepared, this work being carried on, as related on page 70, under a special appropriation. At The Buttes measurements of the discharge of Gila River and also of the Salt and Verde rivers were systematically made, those of the latter streams being under the charge of Mr. W. A. Farish.

California.—In this State the drought of 1898 was the most severe on record, and a large number of low-water measurements were therefore made by Mr. J. B. Lippincott and his assistants. He also maintained the river stations and carried on various investigations in special localities, particularly in southern California.

Colorado.—Mr. A. L. Fellows, deputy State engineer, continued work in Colorado, and not only made measurements at the regular river stations, but obtained data concerning the rivers of the northwestern part of the State, through a reconnaissance trip made in that area.

Idaho.—On account of the resignation of Mr. F. J. Mills, State engineer, the work in Idaho was placed in the hands of Mr. Frank S. Shirley. Assistance was also rendered by Mr. Andrew J. Wiley, of Grandview.

Montana.—Mr. S. M. Emery, director of the Agricultural Experiment Station, continued to cooperate, the river measurements being made by Mr. Roe Emery. In the western part of the State Prof. M. J. Elrod and Prof. Fred D. Smith established and maintained stations in the vicinity of Missoula.

Nevada.—Mr. L. H. Taylor, of Golconda, continued work at various river stations, particularly along the Humboldt, and furnished data concerning reservoir sites and the cost of constructing storage works.

New Mexico.—Measurements of the Rio Grande were made by Mr. P. E. Harroun, of Albuquerque, the work at El Paso being in charge of Mr. W. W. Follett, consulting engineer of the Mexican Boundary Commission.

Oregon.—Investigations in this State were carried on in connection with those on the east in Idaho and on the north in Washington.

Utah.—Prof. Samuel Fortier, of Corinne, continued work in this State and added to the data concerning the flow of water in various canals.

Washington.—Mr. Sydney Arnold, of North Yakima, maintained stations along Yakima River and extended the work wherever practicable. On the extreme west Mr. William J. Ware, of Port Angeles, succeeded Mr. A. Judson Adams.

Wyoming.—River stations in this State were maintained by Mr. Clarence T. Johnston, assistant State engineer, and by his successor, Mr. A. J. Parshall.

RESULTS.

The observations of daily gage height at various localities during 1898 were printed as Water-Supply and Irrigation Papers Nos. 27 and 28. These also give a brief description of the localities, a list of the discharge measurements, and, in condensed form, the rating tables showing the relation of gage height to discharge. These data, being available immediately after the end of the calendar year, are thus made public at an early date. The computation of results of daily and monthly flow and the completion of the diagrams necessitate considerable time, and, therefore, as soon as the detailed data are sent to the printer, these condensed results are computed for insertion in the volume on hydrography. In order, therefore, to obtain in full for 1898 the original data and computed results, it is necessary to have Water-Supply and Irrigation Papers Nos. 27 and 28 as well as the accompanying volume on hydrography—Part IV of this Annual Report.

The operations at river stations for 1897 were printed as Water-Supply and Irrigation Papers Nos. 15 and 16. Following these a series of papers, Nos. 17, 18, and 19, were prepared by Mr. C. E. Grunsky, describing the water supply and development of irrigation in the San Joaquin Valley. Paper No. 20, by Mr. Thomas O. Perry, gives results of experiments with windmills, these being of particular importance in making avail-

able the water supply of the Great Plains region and of the larger valleys of the West. Papers Nos. 21 and 26, as noted above, give a discussion of the well waters of Indiana, prepared by Mr. Frank Leverett. Paper No. 22 is a continuation of Paper No. 3, and gives a description of the results of sewage irrigation, mainly in the United States. Paper No. 23, by Prof. Elwood Mead, treats of water-right problems in the Bighorn Mountains, these being highly complicated, but still to a large extent typical of conditions prevailing throughout the arid region. Papers Nos. 24 and 25, by Mr. George W. Rafter, relate to the water supply of the State of New York. Papers Nos. 27 and 28, as stated above, give the operations at river stations for the year 1898, and Papers Nos. 29 and 30 relate, respectively, to Nebraska and Michigan. Other papers are in course of preparation for early publication.

DIVISION OF MINERAL RESOURCES.

The Division of Mineral Resources, under the direction of Dr. David T. Day, was engaged the first six months of the fiscal year in the completion of the report, Mineral Resources of the United States, 1897, and in its distribution to the public. Before this work was finished the office force of special agents was actively engaged in statistical correspondence between the office and the mineral producers of the United States (except of gold and silver), for the purpose of collecting a statement of the mineral products of the United States for the calendar year 1898. The printing of this report is now far advanced. Papers on the condition of the iron and steel trades, zinc, mineral resources of Porto Rico, sulphur and pyrites, and asbestos and graphite, have been printed and distributed to the public; and there are now in the hands of the printer, for publication as advance extras, papers on stone, coal, clay products, precious stones, asphaltum, salt, copper, manganese, phosphate rock, abrasive materials, soapstone, antimony, mineral paints and barytes, gypsum, and mineral waters.

Considerable time during the year was given to answering letters asking for information concerning the conditions of occurrence and the uses of minerals in the United States.

Dr. Day remained in charge of the mines and mining department of the Omaha Exposition until it closed, in November.

Much detailed study was given to the conditions affecting the minerals of the Western States, particularly the distribution of platinum in the placer gold mines in California, Oregon, and British Columbia. Nearly all the counties of northern California and of southwestern Oregon were visited by Dr. Day, and comparisons were made between the occurrence of platinum there and the well-known deposits in the neighborhood of Granite Creek, British Columbia.

In addition to the various special agents who have aided in the work, Dr. Day was assisted by Mr. E. W. Parker, statistician; Mr. Jefferson Middleton, Miss Helen Hough, Miss Katrine Cottrell, Mrs. L. L. Kimball, clerks; Mr. Theodore H. Johnson, Mr. Griffith Thornton, Miss Belle Worth Bagley, Miss Altha T. Coons, Miss Julia M. Corse, Miss Agnes Gerry, and Mrs. Florence Pollock, statistical experts.

Following is a detailed statement of the mineral products of the United States during the calendar year 1898:

While the normal increase which may be expected in the total value of our mineral products is \$25,000,000 annually, the yearly increase is very irregular. The increase from 1894 to 1895 was nearly \$100,000,000, while that from 1895 to 1896 was but a little over \$1,000,000 and from 1896 to 1897 about \$8,000,000; from 1897 to 1898 the increase was nearly \$67,000,000, or, to be exact, \$66,364,439—from \$630,909,468 in 1897 to \$697,273,907 in 1898—which is considerably more than double the normal increase as noted above. This total is the largest ever recorded for the United States, exceeding by \$49,204,921 the product for 1892, valued at \$648,675,081, which was the largest up to the year under review. This great increase in 1898 is due to a general increase all along the line of mineral products, all the more important of these showing large increases and almost every item showing some gain. The value of all metallic products in 1898 was \$343,400,955, as compared with \$302,198,502 in 1897, a gain of \$41,202,453. All the products except nickel made large gains, gold, copper, lead, zinc, aluminum, and antimony reaching their maximum in both

production and value, while the pig-iron product was greater than in any other year. The value of this product was considerably less than in 1892, although it increased \$21,434,701 over 1897, this being more than one-half the increase in value of the metallic products from 1897 to 1898. The nonmetallic products increased from \$327,710,966 in 1897 to \$352,872,952 in 1898, a gain of \$25,161,986. The largest contributor to this gain was bituminous coal, which increased from \$119,567,224 in 1897 to \$132,586,313 in 1898, a gain of \$13,019,089. The value of anthracite coal, however, fell off nearly \$4,000,000. Other products showing important gains were stone, petroleum, natural gas, and mineral waters.

METALS.

Iron and steel.—The year 1898 proved to be another record breaker in the production of pig iron, 11,773,934 long tons being made in that year, as compared with 9,652,680 long tons in 1897, the largest output at that time. This is an increase of 2,121,254 long tons, or nearly 22 per cent. Large as was the increase in product in 1898 as compared with 1897, it was not so large as the increase in 1895 over 1894. In 1894 the product was 6,657,388 tons, and in 1895 it was 9,446,308, an increase of nearly 42 per cent. In 1897 the increase over 1896 was 1,029,553 tons, or 11.94 per cent. While the quantity in 1898 was greater than in any other year, the value was \$116,557,000, or \$34,643,410 less than the value of the product in 1890, which was the year of maximum value, although the product was only 9,202,703 tons, or 2,571,231 tons less than the product in 1898. The average value of pig iron increased from \$9.85 per ton in 1897 to \$9.90 in 1898. This is the first rise in value per ton noted for some years, the average being \$11.14 in 1895, \$10.47 in 1896, and \$9.85 in 1897.

The production of Bessemer steel ingots was 6,609,017 tons, as compared with 5,475,315 tons in 1897, 3,919,906 in 1896, and 4,909,128 in 1895. The production was more than double that of 1893.

The total production of open-hearth steel in 1898 was 2,230,292 long tons, against 1,608,671 tons in 1897, an increase of 621,621 tons, or over 38 per cent.

Iron ores.—The value of iron ores mined in the United States in 1898 was \$22,012,542, as compared with \$18,953,221 in 1897, a gain of \$3,059,321, thus nearly reaching the value of 1896, \$22,788,069. There was also a gain in the product of 1,760,323 long tons, from 17,518,046 long tons in 1897 to 19,278,369 long tons in 1898. The average price per ton in 1898 was \$1.14, as compared with \$1.09 in 1897 and \$1.42 in 1896.

Gold.—The product continued to increase, and in 1898 was valued at \$64,463,000, as compared with \$57,363,000 in 1897. In 1896 it was \$53,088,000.

Silver.—The coinage value of the silver product in 1898 was \$70,384,485 and the commercial value \$32,118,420; in 1897 the coinage value was \$69,637,172 and the commercial value \$32,316,000. This is an increase in 1898 of \$747,313 in the coinage value and a decrease of \$197,580 in the commercial value. The product increased from 53,860,000 ounces in 1897 to 54,438,000 ounces in 1898. In 1896 the product was 58,834,800 ounces.

Copper.—The copper industry continued in a flourishing condition. The product in 1898 was 526,512,987 pounds, valued at \$61,865,276, the greatest product and value recorded, as compared with 494,078,274 pounds, valued at \$54,080,180, in 1897. The average price per pound in 1898 was 11.75 cents; in 1897 it was 11 cents; in 1896 it was 10.5 cents. The actual scarcity of copper, with the accompanying rise in prices and the enormous expansion of stock speculation, did not take place until the end of the year and did not affect the returns for 1898. The great activity in locating new copper mines is not likely to add materially to the copper product of 1899, on account of the time required to open copper properties and provide reduction plants.

Lead.—The lead product increased from 212,000 short tons in 1897 to 222,000 short tons in 1898, which is the maximum output of this metal in the United States. The value also increased from \$14,885,728 in 1897 to \$16,650,000 in 1898.

Zinc.—This product also increased to 115,399 short tons, valued at \$10,385,910, from 99,980 short tons in 1897, valued

at \$8,498,300. This, too, is the largest product recorded for this country.

Quicksilver.—This product, which declined in 1897, participated in the generally improved conditions in mineral industries in 1898, and increased from 26,648 flasks in 1897 to 31,092 flasks in 1898. The value of the product increased from \$993,445 in 1897 to \$1,188,627 in 1899. The value per flask in 1897 was \$37.28, and in 1898 it was \$38.23.

Aluminum.—This product also made a notable gain in 1898 over 1897. The product was 4,000,000 pounds in 1897, valued at \$1,500,000; in 1898 it was 5,200,000 pounds, valued at \$1,716,000.

Antimony.—The total amount of metallic antimony produced in 1898 was 1,120 short tons, as compared with 756 short tons in 1897. The value of the product in 1898 was \$184,050, and in 1897 it was \$109,655. This product included the antimony derived from imported ores, about 80 per cent being so obtained. The amount of antimony ore mined in the United States in 1898 was 697 short tons, all of which came from the far West.

FUELS.

Coal.—The combined product of anthracite and bituminous coal in 1898 amounted to 196,405,953 long tons, equivalent to 219,974,667 short tons, an increase of $9\frac{1}{2}$ per cent over the product in 1897, which was 178,769,344 long tons, or 200,221,665 short tons. The actual increase in 1898 as compared with the preceding year was 17,636,609 long tons, or 19,753,002 short tons. The value of the product increased a little less than 5 per cent, from \$198,869,178 to \$208,000,850. This enormous production in 1898 made that year the banner coal-producing year in the history of the United States, as 1897 was up to that time. The increase in production in 1898 was almost exclusively in that of bituminous coal. There was an increase of 688,361 long tons in the output of anthracite coal, but the consumption at the collieries increased 470,154 long tons, so that the marketed product indicated an increase of only 218,207 long tons. In addition to this practically stationary condition of the production of anthracite coal, the value

of the product in 1898 was \$3,887,417 less than the slightly smaller output of the preceding year. The average annual production of anthracite coal in the last five years was equivalent to 48,261,000 long tons, showing that the product in 1898 was about 600,000 long tons less than the average of the last five years. On the other hand, the production of bituminous coal increased from 131,794,630 long tons, or 147,609,985 short tons, to 148,742,878 long tons, or 166,592,023 short tons, a gain of 12.86 per cent. The actual increase in tonnage was 16,948,248 long tons, or 18,982,038 short tons, with an increase in value of practically \$13,000,000. For many years prior to 1898 the demand for bituminous coal was less than the supply, and operators consequently had to contend with a surfeited market. In 1898 these conditions were reversed, and instead of struggling to obtain new markets for their coal or endeavoring to hold the old ones, operators were for a great deal of the time unable to fill their orders promptly. This condition was not due to the extraordinarily cold weather, but almost entirely to the activity in the iron and steel and other industries, the demand for coal being as steady throughout the summer as during the winter. The demand for labor was such in other branches of the industry that in many cases operators found it difficult to secure a sufficient number of miners and laborers to carry on their work. Notwithstanding this condition of affairs, the average price per ton received for the bituminous coal in 1898 showed a decline from 81 cents in 1897 to 80 cents in 1898, this being a continuation of the decline in prices which lasted from 1887 to the close of 1898. The probable cause of this rather anomalous condition of affairs is that the economies which have been forced upon producers during the preceding ten years have eventuated in the ability of the operators to produce coal at less cost to the consumer and at the same time at profit to themselves. Unquestionably the introduction of coal-cutting machinery in the bituminous coal mines of the United States had much to do with this decreased value, and one of the striking features of the bituminous coal-mining industry in 1898 was the phenomenal increase in the product obtained by the use of

machines. Coal so extracted increased from 22,649,220 short tons in 1897 to 32,413,144 short tons in 1898, and represented more than 50 per cent of the total increase in the production of bituminous coal. Another factor which bears on the decrease in the average price is the increased production by the larger mining properties as compared with the smaller ones; the former, being equipped with labor-saving machinery, were able to produce and sell coal at a less figure. The increased production of cheaper coal would have a tendency to lessen the average price for the State, whereas in reality there may have been no actual decline in the value at any one mine.

In discussing the production of anthracite and bituminous coal the anthracite product of Colorado and New Mexico, the semianthracite product of Arkansas and Virginia, the lignitic coals of Colorado, North Dakota, California, Oregon, and Texas, and semibituminous, cannel, splint, and block coals are included in the bituminous product.

Of the thirty States which contributed to the production in 1898 in twenty-two the output was the largest on record. The total product of anthracite and bituminous coal in 1898 was a little more than three times that in 1880, the first year for which the Survey collected statistics.

Coke.—In the production of coke, as in the production of coal, the year 1898 was one of unprecedented activity. The output in that year amounted to 16,047,209 short tons, as compared with 13,288,984 short tons in 1897, equivalent to an increase of 2,713,494 short tons, or a little more than 20 per cent, over the output in 1895, which was the year of largest previous production. This increase in the manufacture of coke in 1898 may be traced directly to the impetus given to the iron and steel working industries during last year. The actual increase in 1898 over 1897 was 2,758,225 short tons, of which practically 1,700,000 tons were in Pennsylvania, and of this increase in Pennsylvania 1,450,000 tons were in the increased output from the Connellsville region alone. The production in West Virginia, which is the second largest producing State, was 1,925,071 short tons, an increase of 452,405 short tons, or 30.72 per cent, over that of 1897. Alabama

increased its production from 1,443,017 short tons to 1,663,020 short tons, a gain of 220,003 short tons, or 15.25 per cent. The production in Virginia increased 50 per cent, from 354,067 short tons to 531,161 short tons. Colorado (including a small amount from Utah) increased from 342,653 short tons to 474,808 short tons, a gain of 132,155 short tons, or 38.6 per cent. The production increased in 12 States and decreased in 8 States, but the aggregate of the decreases of the 8 States was less than 50,000 tons.

Petroleum.—The production of crude petroleum decreased from 60,568,081 barrels in 1897 to 55,364,233 barrels in 1898, a loss of 5,203,848 barrels, while the value increased \$3,263,748, from \$40,929,611 in 1897 to \$44,193,359 in 1898, indicating a healthy recovery in 1898 from the depressed prices of the preceding year.

Natural gas.—With the gradual exhaustion of supply the production of natural gas continued to decrease in amount, but with the higher prices set by producers the value increased from \$13,826,422 in 1897 to \$14,750,000 in 1898.

STRUCTURAL MATERIALS.

Stone.—The total value of stone of all kinds increased from \$34,667,772 in 1897 to \$36,607,264 in 1898. All kinds of stone except marble, which showed a slight decline from the 1897 figures, participated in the increase.

The exports of slate continued to increase in value, rising from \$266,385 in 1896 to \$780,112 in 1897 and \$1,370,075 in 1898.

Clays.—There was a marked increase in the value of the clay products in 1898, from \$62,359,991 in 1897 to \$71,597,380 in 1898. These figures, however, include pottery products, which in 1898 amounted to something over \$13,000,000.

In 1898 the value of brick clays in the crude state was about \$9,000,000, and of other clays about \$1,000,000.

Cement.—The Portland-cement product increased from 2,677,775 barrels in 1897 to 3,692,284 barrels in 1898, a gain of 1,014,509 barrels, or 37.9 per cent. The value increased from \$4,315,891 in 1897 to \$5,970,773 in 1898, a gain of

38.34 per cent. Since 1896 the annual increase of production has been more than 1,000,000 barrels of Portland cement, and the prospects are good for this increase to be continued and even exceeded.

The natural-rock-cement production showed an increase from 8,311,688 barrels in 1897 to 8,418,924 barrels in 1898, while the value increased from \$3,862,392 in 1897 to \$3,888,728 in 1898.

ABRASIVE MATERIALS.

Millstones.—The value of the production in 1898 was almost identical with that of 1897, being \$25,934 in the former year and \$25,932 in the latter year.

Grindstones.—This product showed a marked increase, from \$368,058 in 1897 to \$489,769 in 1898, an increase of \$121,711, or 33 per cent. The product in 1898 was the largest recorded in the last ten years. The 1898 value of the product was more than twice that of 1895.

Corundum and emery.—This combined product suddenly nearly doubled. In 1897 it was 2,165 tons; in 1898, 4,064 tons. The value increased in even greater proportion, from \$106,574 in 1897 to \$275,064 in 1898. For the three or four years preceding 1898 this product showed but little change.

Oilstones.—The value of this product increased from \$149,970 in 1897 to \$180,738 in 1898; in 1896 it was \$127,098. This product continued to be under the control of practically one firm.

Infusorial earth.—This product showed a decline from 3,833 tons in 1897, valued at \$22,835, to 2,733 tons in 1898, valued at \$16,691. Included in these figures is the product of tripoli from Virginia.

Garnet.—The garnet product in the United States for abrasive purposes increased from 2,554 tons in 1897, worth \$80,853, to 2,967 tons in 1898, valued at \$86,850.

CHEMICAL MATERIALS.

Phosphate rock.—Continuation of the exploitation of the phosphate-rock deposits of Tennessee largely increased the production in that State in 1898 as compared with 1897, the totals

for the two years being 128,723 long tons in 1897 and 308,107 long tons in 1898. The industry in Florida has grown entirely out of the speculative stage and is now being conducted along conservative lines. The production in 1898 amounted to 600,894 long tons, as compared with 552,342 long tons in 1897. The South Carolina product amounted to 298,610 long tons of land and 101,274 long tons of river rock in 1898, against 267,380 long tons of land and 90,900 long tons of river rock in 1897. The total product for the United States amounted to 1,308,885 long tons in 1898, as compared with 1,039,345 long tons in 1897. The aggregate value in 1898 amounted to \$3,453,460, against \$2,673,202 in 1897. The average price per ton for all kinds of rock increased from \$2.57 in 1897 to \$2.64 in 1898.

Gypsum.—The total product of gypsum in 1898 was not materially different from that of the preceding year, the output of crude in the two years being 288,982 short tons in 1897 and 291,638 short tons in 1898. There was a slight decline in value, from \$755,864 in 1897 to \$755,280 in 1898, this decline being due principally to the competition for trade in calcined plaster or stucco. In arriving at the value the product is taken in its first marketable condition; that is to say, the amount sold crude is taken at its value crude. The value of land plaster is given for the ground fertilizer, and the value of stucco or calcined plaster is for the calcined product.

Salt.—The production of salt in the United States was the largest on record, amounting to 17,612,634 barrels of 280 pounds, as compared with 15,973,202 barrels in 1897 and 13,850,726 barrels in 1896, each of these three years marking the largest production up to that time. The increased production in 1898 was accompanied by an advance of 15 per cent in prices, the total value increasing from \$4,920,020 in 1897 to \$6,212,554 in 1898. The average price per barrel received by producers in 1898 was 35.3 cents net. The highest figure obtained since 1894 in the average price is 36.5 cents net per barrel. The principal items of interest in connection with the salt industry in 1898 were the formation of a combination among the producers in the Warsaw district of New York and the active exploitation of the rock-salt mines of Louisiana.

Bromine.—This product was practically the same in 1897 and 1898, being 487,149 pounds in 1897 and 486,979 pounds in 1898, a decline of only 170 pounds. The value showed a greater decline, from \$129,094 in 1897 to \$126,614 in 1898, a loss of \$2,480.

Borax.—The product was the same in both 1897 and 1898, viz, 16,000,000 pounds. The value, however, was slightly greater in the latter year—\$1,120,000, as compared with \$1,080,000 in the former year.

Fluorspar.—This product, which showed a decline in 1897, when its output was 5,062 short tons, increased again in 1898, when the product was 7,675 tons, surpassing any year since 1893, when the output was 12,400 tons. The value increased in even greater proportion than the product. In 1897 it was \$37,159, while in 1898 it was \$63,050, an increase of \$25,891, or 69.68 per cent. The product increased 2,613 tons, or 51.62 per cent.

Sulphur.—The mines of Louisiana continued idle. The production in 1898, all of which was from Beaver County, Utah, amounted to 1,200 short tons, valued at \$32,960, as compared with 2,275 short tons, valued at \$45,590, in 1897. Prospecting work in the sulphur deposits in Texas was continued, but such exploitation work as was accomplished did not result in any marketable product.

Pyrite.—The production of iron pyrite for its sulphur content and for the manufacture of sulphuric acid continued to increase, with a demand in 1898 fully up to and at times in excess of the supply. The production in 1898 amounted to 193,364 long tons, valued at \$593,801, as compared with 143,201 long tons, valued at \$391,541, in 1897. The displacement of sulphur by iron pyrite in the manufacture of sulphuric acid has shown a remarkable increase during the last few years. The amount of sulphur displaced by pyrite in 1898 was considerably more than double the amount in 1891, seven years before.

PIGMENTS.

Metallic paint.—Exclusive of mortar colors, the amount of hematite iron ore ground and used as pigment in 1898 was

20,972 short tons, valued at \$263,979, against 16,699 short tons, valued at \$187,694, in 1897. The production of mortar color decreased from 8,237 tons in 1897 to 7,107 tons in 1898. The value of mortar color produced in 1898 was, however, but slightly less than that in the preceding year.

Ocher, umber, and sienna.—The production of ocher in 1898 was 11,963 short tons, a decrease from 14,006 tons in 1897; and the value likewise declined from \$162,764 to \$123,832. Including the production reported as Spanish brown from Maryland, the production of umber in 1897 was 1,080 tons; in 1898 it was 1,177 tons. The Spanish brown included in this product amounted to 600 tons in 1897 and 640 tons in 1898. The aggregate value of umber declined from \$11,710 in 1897 to \$8,285 in 1898. The production of sienna increased from 620 to 689 tons, with slight variation in price.

Venetian red.—The production of this pigment in 1897 was phenomenal, being more than three times that in 1896 and amounting to 13,603 short tons. The output in 1898 was somewhat less, amounting to 10,271 tons, with a decided decline in value, induced doubtless by the heavy production of the preceding year.

Zinc white.—The consumption of zinc oxide as a basis for white and colored pigments continued to increase, the amount of this material produced in 1898 being 33,000 short tons, valued at \$2,310,000, against 25,000 short tons, worth \$1,750,000, in 1897.

Barytes.—The production of barytes or heavy spar in 1898 was about 20 per cent in excess of that of the preceding year, and amounted to 31,306 short tons, valued at \$108,339. This is the largest production, both in amount and in value, since 1892.

Cobalt oxide.—The production decreased from 19,520 pounds, valued at \$31,232, in 1897, to 7,848 pounds, valued at \$11,772, in 1898.

MISCELLANEOUS.

Fuller's earth.—This is one of the few products which showed a decline in 1898, the product in that year being 14,860 short tons, valued at \$106,500, as compared with

17,113 short tons in 1897, valued at \$112,272. The product continued to come almost entirely from Florida.

Precious stones.—The value of the product increased from \$130,675 in 1897 to \$160,920 in 1898, an increase of 23.15 per cent. The principal features of the year were the finding of rock crystals in California almost equal to the Japanese, and the successful cutting of these in this country as large as 7 inches in diameter; the increased output of Montana sapphires, the continued output of New Mexico turquoise mines, the finding of tourmalines in Maine and Connecticut, the large increase in imports of diamonds, and the increase in the diamond-cutting industry in the United States.

Mica.—The sheet-mica product continued to increase, rising from 82,676 pounds in 1897 to 129,520 pounds (a gain of 56.66 per cent) in 1898, which is the largest product since 1885. The value increased, but not in the same proportion, rising from \$80,774 in 1897 to \$103,534, an increase of \$22,760, or 28.18 per cent. In addition there were sold 3,999 tons of scrap mica for use in the manufacture of lubricants, wall papers, boiler coverings, etc., valued at \$27,564, as compared with 740 tons in 1897, valued at \$14,452.

Feldspar.—This product showed a slight gain, from 11,175 long tons in 1897 to 12,000 in 1898, while the value declined from \$43,100 in 1897 to \$32,395 in 1898.

Flint.—This is chiefly ground quartz. The product increased 60 per cent, from 11,952 long tons in 1897 to 19,130 in 1898. The value increased from \$26,227 in 1897 to \$42,670 in 1898, a gain of \$16,433, or 62.7 per cent.

Asphaltum.—Under the general head of asphaltum are included the numerous varieties of bitumens or hydrocarbons occurring in the United States which are not discussed in connection with petroleum. These varieties include the hard and liquid asphaltum and the sandstone and limestone impregnated with bitumen which are commonly known as bituminous sandstone and bituminous limestone, or bituminous rock. The aggregate product of the several varieties in 1898 amounted to 76,337 short tons, an increase of 392 tons from the 75,945 tons produced in 1897. The value also increased from \$664,632 in

1897 to \$675,649 in 1898. The value of the product in 1898 was the largest recorded, though there were two other years, 1892 and 1896, when the product exceeded that of 1898.

Asbestos.—The production was in both 1897 and 1898 limited to two States, California and Georgia, and, relative to the domestic consumption, is insignificant. The total production in 1898 amounted to 605 short tons, against 580 short tons in 1897; the value of the production in 1898 was \$10,300 and in 1897 \$6,450. The value of the asbestos imported into the United States, most of which was from Black Lake and Tatford in Canada, amounted in 1897 to \$268,264 and in 1898 to \$300,533.

Graphite.—The production of crystalline graphite in 1898 amounted to 2,360,000 pounds in its marketable condition, and the amount of amorphous and graphitic coal was 890 short tons. In 1897 the figures were 1,254,402 pounds and 1,108 short tons. The aggregate value of the production in 1898 was \$75,200; in 1897, \$54,277.

Soapstone.—The industry in 1898 was marked by a slight increase in production and a decided increase in value; the output amounted to 22,231 short tons in 1898, valued at \$287,112, against 21,923 short tons in 1897, valued at \$365,629. The production has not varied materially in the last six years, having ranged during this time between 21,071 and 23,144 tons, a difference of less than 10 per cent. The value has varied from \$255,067 to \$401,325, each year showing considerable fluctuations, due principally to the condition in which the material was sold. Values placed on the product are those in its first marketable condition.

Magnesite.—This product made proportionately a decided advance in value—from \$13,671 in 1897 to \$19,075 in 1898, a gain of \$5,404, or about 40 per cent. The quantity produced increased from 1,143 short tons to 1,263 tons, a gain of 120 tons, or about 10.5 per cent. This product, as heretofore, came entirely from California.

Mineral waters.—This product increased from 23,255,911 gallons sold in 1897, valued at \$4,599,106, to the maximum product and value in 1898—28,853,464 gallons sold, valued at

\$8,051,833. This is an increase in product of 5,597,553 gallons, or about 24 per cent, while the value increased \$3,546,213, or 75.07 per cent.

Limestone for iron flux.—This product naturally increased with the iron product; it rose from 4,247,688 long tons in 1897, valued at \$2,124,000, to 5,275,819 long tons in 1898, valued at \$2,638,000, an increase of 24.20 per cent in both product and value.

Bauxite.—The product in 1898 was 25,149 long tons, worth \$75,437, as compared with 20,590 long tons in 1897, valued at \$57,652, an increase over 1897 of 4,559 tons, or 22 per cent, in quantity, and \$17,785, or 31 per cent, in value.

Monazite.—This product made the largest proportionate gain—from 44,000 pounds in 1897 to 250,776 pounds in 1898, an increase of 470 per cent, while the value rose from \$1,980 in 1897 to \$13,542 in 1898, a gain of 584 per cent.

TOPOGRAPHIC BRANCH.

Twenty years have elapsed since the United States Geological Survey was created by law as a bureau of the Department of the Interior. Its work has included investigations relating to geology, hydrography, irrigation, forestry, and other kindred subjects. As a basis for these investigations, as well as for general industrial and educational purposes, the preparation of topographic maps was considered imperative, and a brief review of the development of topographic methods and results is considered appropriate at this time.

The organic law of March 3, 1879, to which the Survey originally owed its existence, left some room for doubt as to the precise intention of Congress in regard to its functions and to the limitations of its field. The law provided for the classification of the public lands and the examination of the geologic structure of the national domain. The policy determined on as being in accordance with the proper interpretation of the law was "to produce a series of land maps which should show all those features upon which intelligent agriculturists, miners, engineers, and timbermen might hereafter base their operations, and which would obviously be of the highest

value to all students of the political economy and resources of the United States."

An ambiguity was found to exist in the term "national domain," which might mean the land actually owned by the nation or the area within its boundaries. A conservative course was adopted and the surveys were at first (1879) planned so as to include only areas within the limits of the public lands. This limitation was observed until the passage of the act relating to the surveys for the fiscal year 1882-83, in which a clause was inserted reading, in part, "to continue the preparation of a geologic map of the United States." This was considered sufficient authority for the extension of the geologic and topographic surveys into any portion of the United States. Until the passage of the act making appropriation for "sundry civil expenses of the Government for the fiscal year ending June 30, 1889," appropriations for the Survey were made in a lump sum and were allotted for various purposes at the discretion of the Director. In that act topography received a distinct recognition at the hands of Congress, the sum of \$199,000 being provided for "topographic surveys in various portions of the United States." Thus while during the first decade of the existence of the Geological Survey topographic surveys were executed as a necessary adjunct to the geologic work, at the beginning of the second decade the value of topographic maps had become so apparent that no difficulty was experienced in obtaining specific legislation relating to their preparation and publication.

Dating nearly from the beginning of the century, surveying expeditions, mainly under the War Department, were dispatched in various directions over the mountain regions of the far West, where topographic mapping on an extended scale may be said to have had its beginning in this country. In these expeditions traverse lines were run, with control by astronomic observations, and a number of rough maps or sketches were produced. Following these expeditionary surveys, between the years 1867 and 1879, there existed various independent organizations which had for their object the systematic exploration of certain selected regions. These organi-

zations were officially designated "Geological Exploration of the Fortieth Parallel," "The Geological and Geographical Survey of the Territories," "The Geographical and Geological Survey of the Rocky Mountain Region," and "Geographical Surveys West of the One Hundredth Meridian," but they were popularly known as the King, Hayden, Powell, and Wheeler surveys, respectively, after their directing officers. Topographic mapping in connection with geologic investigation under the above-mentioned organizations was prosecuted vigorously and may be said to have passed from the expeditionary to the reconnaissance stage. The work generally was controlled by triangulation of fair accuracy, and details were filled in by long-distance sketching, usually carried on in connection with triangulation, which was supplemented by meanders of the routes traversed. No attempt was made to obtain any considerable refinement of detail, and the plane table, now recognized as an indispensable instrument in connection with topographic work, was little used. The scale of the work was 4 miles to the inch, with a contour interval varying from 200 to 300 feet. About 360,000 square miles of territory were thus surveyed.

When the four independent surveys were replaced by the United States Geological Survey, in 1879, the new organization followed to a certain extent the topographic methods of its predecessors, the plane table, however, being substituted for the sketchbook. As long as the work remained exclusively in the West, where the population, and consequently the culture, were small in amount and the features to be represented were usually broad and without much detail, the maps were made almost entirely by sketching from the plane-table stations, which could usually be selected on bare summits. When operations were extended to the more thickly populated, though still mountainous, districts of the Appalachian region, a different condition was encountered. The mountain sides, and frequently the summits, were covered with timber, so that comparatively few points could be used for location or sketching purposes. Thus the necessity arose for a large amount of traversing, not only to obtain the alignment and vertical elements

of the numerous roads, but also as an adjunct in securing other topographic detail. Originally the traversing consisted in recording magnetic courses and distances as measured or estimated and making perspective sketches in the notebook, the results being afterwards plotted and the contours drawn in the office. The advantages of the traverse plane table in this connection soon became apparent, and its introduction in topographic work marked an important era in the development of the methods existing at present. This plane table is a simplified modification of the instrument generally used; it has few adjustments, and it is useful either in traversing roads, where the distance can be accurately measured, or in carrying lines over mountain trails or through forests, where the distances at times have to be estimated by pacing or otherwise. The previous statement may need some explanation. Ordinarily one would consider the data obtained from a line run with paced or estimated distances too inaccurate to produce satisfactory or reliable results; but where such lines are properly checked information of a very exact nature may be obtained. Thus, for instance, a traverse line may be carried with advantage by carefully pacing from a known position on one road through a thickly wooded or rugged region to a known position on another road. These known points being located on the plane table, when the connection is formed it is seen at once whether the closure is satisfactory. In a similar manner the aneroid barometer—which as an instrument for the precise measurement of heights is regarded as very unreliable—is extensively and advantageously used for obtaining intermediate elevations by being transported quickly between points whose heights are known. By the use of the plane table, both of the ordinary and of the traverse type, mapping is completed in the field and all doubtful questions are settled as they arise.

Topographic work in the West, up to and for some time after the commencement of operations in the East, can not be given higher rank than that of first-class reconnaissance surveys, and this class will also include the earlier work in the Eastern and Central States. The scales employed in the early work of the Survey were small—1 : 250000, or about 4 miles to the inch,

for the greater part of the country, and 1:125000, or about 2 miles to the inch, in the more thickly settled and important regions. Subsequently, as the work progressed, the scales were enlarged, the most important portions of the country being mapped on the scale of 1:62500, which is very nearly 1 mile to the inch, while the areas over which the scale of 1:125000 applied were greatly extended, and the scale of 1:250000, after an experience of four or five years, was abandoned.

The representation of relief was from the beginning effected by means of contour lines, the intervals between contours differing with different scales and with the character of the surveys.

The earlier work of the Survey has been subject to some criticism on account of the lack of refinement of detail. The less accurate maps cost less, and it was a question of judgment as to how much should be expended on a certain area and how much detail should be secured. The standard in topographic surveying is to produce a map that will meet all reasonable requirements suggested by the scale adopted. It would be as much a waste of time and money to go beyond these requirements as it would be culpable to fall short of them. The present work of the Survey costs from \$10 to \$15 per square mile for the inch-mile scale. By enlarging the scale, \$100 or \$1,000, or even \$10,000, might be expended on a survey of a square mile of area, and still there might be requirements which could be met only by securing further detail. The survey of the town and island of Bombay, India, cost an average of \$6,815 per square mile, on a scale of 16 inches to 1 mile, and some portions of it doubtless reached the extreme amount above mentioned. The map of the District of Columbia, by the United States Coast and Geodetic Survey, cost about \$3,000 per square mile, on a scale of about 13 inches to 1 mile.

Any map resulting from a survey may be considered as consisting of a number of located points, these located points constituting what is termed "control," with the intervening points filled in by sketching, and, other things being equal, the accuracy of the map is directly comparable with the num-

ber of located points. Thus an absolutely perfect map would be one on which an infinite number of points had been located. The thoroughness of the control by location on the maps as now produced is roughly indicated by the statement that the average number of located points for each square inch of map area is about fourteen. From the nature of the case the accuracy of the sketching can not be similarly characterized by numerical statement, since it depends in part on the personal skill of the topographer as well as on the number and arrangement of the located points.

The topographic work has steadily advanced not only in scope but in accuracy, until it is believed that the maps now produced are fully equal to any requirements which may be reasonably imposed upon them, and take rank with those produced by any other country on a corresponding scale.

The technical work of the Survey as practiced may be briefly described. The methods employed for horizontal location include astronomic location, base-line measurement, primary triangulation or traverse; and secondary triangulation or traverse. Astronomic determinations are made by the most approved methods and instruments—the transit instruments and telegraph for longitude and the zenith telescope (Talcott's method) for latitude. Base lines are measured by steel tapes, fullest possible provision being made for their correction for temperature, the measurements being taken at night or during cloudy weather and the temperature being carefully observed by thermometers. Primary triangulation is carried on by the use of theodolites having circles 8 inches in diameter and reading by two microscopes to single seconds of arc. The traverse work is executed with theodolites or with plane tables, according to whether it is primary or secondary. For vertical location the processes fall under the heads of precise leveling, primary spirit leveling, secondary spirit leveling, vertical angulation, and aneroid determinations. The spirit leveling is of a high order, much beyond any practical requirements for map making, and fully answers any questions that may arise from an engineering standpoint.

Thus three or more points are located on each atlas sheet,

i. e., on each area 15 or 30 minutes square, according to the scale. These points are plotted upon plane-table sheets on a scale somewhat larger than the publication scale, and the work from these points is carried forward by the graphic methods of the plane table. These methods consist simply in the location in position and altitude of a sufficient number of well-distributed points and the sketching of the features of the country with reference to these located points.

In order to make clear the scope of the maps the various items that enter into their composition are enumerated. They are printed in three colors. In black is shown the culture, which includes buildings, roads, trails, railroads, street railroads, tunnels, bridges, ferries, fords, dams, locks, township and section lines, boundary lines of States and counties, cities, triangulation stations, bench marks, mines, quarries, and prospect holes. In blue are shown the drainage features, such as streams, falls and rapids, intermittent streams, canals, ditches, lakes, ponds, glaciers, springs, fresh marshes, salt marshes, and tidal flats. In brown are printed the features relating to relief, including the height above sea level as instrumentally determined and contours showing the height and form of the land surface.

The sheets are engraved on copper, three plates being used for each sheet, one for each color as indicated above. In printing, the matter on the copper plates is transferred to stone, no printing being done from the copper plates.

Under the plan above described the work went on continuously with little variation until the year 1895, when certain duties in addition to the preparation of maps were imposed upon the Topographic Branch. By act of Congress the Geological Survey was intrusted with the survey and subdivision of the lands held by Indians in Indian Territory. Such subdivision had previously been done by contract. This work has been satisfactorily completed, including the preparation of topographic maps of the entire area, at a cost somewhat less than the usual rates paid to contractors.

In 1896 another step in advance was taken, one which affected all the topographic work carried on by the Survey.

Legislation was adopted requiring the establishment at certain intervals, accurately determined, of permanent bench marks, bearing on them in figures the elevation above mean sea level. This involved the running of accurate lines of levels throughout the areas under survey and was a decided advantage in obtaining much better vertical control for the preparation of maps.

By act of Congress approved June 4, 1897, the survey of the forest reserves of the United States was placed in charge of the Director of the Geological Survey. At present there are within the reserves about 67,750 square miles of area, of which about 19,000 square miles have been surveyed—about 1,000 square miles on the scale of 1:62500, 10,000 square miles on the scale of 1:125000, and 8,000 square miles on the scale of 1:250000. The survey of the forest reserves will include the making of a topographic base map and the plotting of the areas of agricultural, forest, and settled lands now included within the limits of the reserves.

In the same act provision was made for the running of the boundary line between Idaho and Montana north of the Bitter-root Mountains. The necessary surveys have been completed, and it only remains now to place the monuments.

In 1898 four parties were dispatched to Alaska for the purpose of extending reconnaissance surveys over regions about which little was known geographically. These parties explored portions of the White, Tanana, Kuskokwim, Sushitna, Matanuska, and Copper rivers, and in addition made a detailed map of a quadrangle in the Klondike region on the scale of 1:250000.

The topographic work has been carried into all the States and Territories, and about 27 per cent of the entire area exclusive of Alaska has been surveyed. The total area surveyed is about 800,000 square miles, but these figures include upward of 200,000 square miles mapped in early years on the scale of 1:250000, much of which should be resurveyed. Exclusive of this amount, about 19 per cent of the total area has been adequately covered. The States of Connecticut, Delaware, Massachusetts, New Jersey, and Rhode Island, the District of Columbia,

and the Indian Territory have been completely mapped. Over one-half of the area of each of the following States has been surveyed: Arizona, Kansas, Maryland, Virginia, and West Virginia. Less than 10 per cent of the area of the following States has been covered: Florida, Illinois, Indiana, Michigan, Minnesota, Mississippi, Ohio, and Washington. At the present rate of progress something over one hundred years will be required to complete the Topographic Atlas of the United States, exclusive of Alaska, and over one hundred and ten years if provision is made for the resurvey of the 4-mile work. The total amount appropriated and expended for topographic work has been about \$3,500,000.

A statement in relation to the development of the topographic work would not be complete without mention of cooperation by the various States with the Geological Survey. The maps were needed by the States, and the State legislatures thought it wise to make appropriations to hasten their completion. The interested States have appropriated one-half of the amount expended and the United States the other half. Maine, Connecticut, Massachusetts, Rhode Island, New York, Pennsylvania, New Jersey, Maryland, West Virginia, North Carolina, and Alabama have thus contributed to the work, and the total amount appropriated by them for this purpose has been something over \$300,000.

The results of the topographic work appear on 976 maps or sheets, as follows: 59 on the scale of 1:250000, 443 on the scale of 1:125000, 462 on the scale of 1:62500, and 12 on special scales.

The organization of the Topographic Branch during the last fiscal year remained the same as in previous years, with the exception that the work of the Indian Territory section was brought to completion toward the close of the year, and Mr. C. H. Fitch, topographer in charge, was assigned to duty in connection with the survey of the forest reserves.

With reference to the character of work, there are two divisions, the Division of Triangulation, under which falls everything relating to the control for the topographic mapping—that is, the furnishing of initial points, including astronomic location,

base-line measurement, triangulation, and primary traverse—and the Division of Topography, to which belong all details, including spirit leveling, pertaining to the preparation of the topographic map of the United States other than those mentioned above.

For the purpose of administration there have been throughout the year four sections: Atlantic section, under Mr. H. M. Wilson; Central section, under Mr. John H. Renshaw; Rocky Mountain section, under Mr. E. M. Douglas; Pacific section, under Mr. R. U. Goode (and, until March, the Indian Territory section, under Mr. C. H. Fitch).

The topographic corps was increased by the addition of four topographers—Messrs. Jeremiah Ahern, W. T. Turner, Sledge Tatum, and A. C. Roberts—by transfer, and of three assistant topographers—Messrs. Pierson Chapman, A. H. Bumstead, and W. N. Morrill—by certification by the Civil Service Commission.

Cooperative agreements were arranged with three States, \$25,000 having been appropriated by New York, \$5,000 by Maryland, and \$500 by West Virginia.

Provision was made in the general deficiency bill approved March 3, 1899, for locating the ninety-eighth meridian, the boundary line between Oklahoma and Indian Territory, under the supervision of the Director of the Geological Survey. The sum of \$6,300 was appropriated, and the work was placed in charge of Mr. E. M. Douglas, geographer.

In connection with the topographic surveys, surveys of forest reserves, Indian Territory surveys, and the survey of the Idaho-Montana boundary line, the following results were obtained:

One astronomic determination of latitude and longitude was made; 2 base lines were measured; 81 observations for azimuths were obtained and the corresponding lines marked; 203 triangulation stations were occupied; 694 miles of primary traverse were run; 26,380 square miles were covered by detailed topographic mapping, this area being distributed through 31 States and Territories, and 2,069 miles being in Alaska; 8,505 miles of levels were run and 1,318 permanent

bench marks were established, these bench marks being iron posts, bronze or aluminum tablets, or copper or aluminum plugs; and in connection with the Alaska surveys 2,409 miles of reconnaissance traverse were run. With reference to the land surveys, there were run 17 miles of standard lines, 81 miles of township or exterior lines, 1,026 miles of subdivisional or section lines, 10 miles of retracement lines, and 4 miles of town-site lines; and in connection with the Idaho-Montana boundary line, 72 miles of stadia traverse.

The distribution of the control, topographic, and leveling work in the various States and Territories is shown on Pls. I and II, in pocket. The following tables give the details relating to topography and spirit leveling for the fiscal year:

Topographic surveys of the United States Geological Survey in 1898-99, including miles of levels run and permanent bench marks established.

State or Territory.	Contour interval.	Scale of publication.		Total area.	Levels.	
		1:62500.	1:125000.		Distance run.	Number of bench marks.
	<i>Feet.</i>	<i>Sq. miles.</i>	<i>Sq. miles.</i>	<i>Sq. miles.</i>	<i>Miles.</i>	
Alaska	100			<i>a</i> 2, 069		
Alabama			1, 368	1, 368	50	8
Arkansas	50		969	969	265	22
California	50-100	494	1, 474	1, 968	564	113
Colorado	50-100	70		<i>b</i> 105	56	13
Georgia					280	41
Idaho	100		470	470	304	44
Illinois	50		50	50		
Iowa	20		878	878	237	21
Kansas	20		1, 652	1, 652	116	38
Kentucky	20	167		167	34	3
Maryland	20	680		680	138	13
Massachusetts	20			<i>c</i> 155	17	
Michigan	20	128		128	102	5
Minnesota	20	195		195	131	
Missouri	50		711	711	111	21
Montana	50-100	50	320	370	421	48
Nebraska	20		1, 115	1, 115	273	50
New Jersey	10			<i>d</i> 4		

a 2,069 square miles on scale of 1:250000, with contour interval of 100 feet.

b 85 square miles on scale of 1:23600, with contour interval of 50 feet.

c 155 square miles on scale of 1:20000, with contour interval of 20 feet.

d 4 square miles on scale of 1,000 feet to 1 inch, with contour interval of 10 feet.

*Topographic surveys of the United States Geological Survey in
1898-99, etc.—Continued.*

State or Territory.	Contour interval.	Scale of publication.			Levels.	
		1:62500.	1:125000.	Total area.	Distance run.	Number of bench marks.
	<i>Fect.</i>	<i>Sq. miles.</i>	<i>Sq. miles.</i>	<i>Sq. miles.</i>	<i>Miles.</i>	
New York.....	20	3,345	.....	3,345	1,940	223
North Carolina....	100	.....	443	443	127	14
Ohio.....	20	528	.....	528	220	18
Oregon.....	100	.....	1,014	1,014	464	94
Pennsylvania.....	20	104	.....	104	20	2
South Dakota.....	20-50-100	214	1,296	1,510	275	54
Texas.....	25-50	.....	1,775	1,775	564	138
Utah.....	.....	.....	.....	.....	52	21
Washington.....	100	.....	2,487	2,487	1,137	191
West Virginia....	20	140	443	583	150	21
Wisconsin.....	20	217	50	267	107	14
Wyoming.....	100	.....	1,270	1,270	350	85
Total.....	.....	6,332	17,785	26,380	8,505	1,318

*The present condition of topographic surveys and the new areas surveyed
in 1898-99.*

[Areas which were resurveyed are not included in this table.]

State or Territory.	Total area.	Area surveyed in 1898-99.		Area surveyed to date.	
	<i>Square miles.</i>	<i>Square miles.</i>	<i>Square miles.</i>	<i>Per cent.</i>	
Alabama.....	52,250	.....	15,063	29	
Arizona.....	113,020	.....	56,790	50	
Arkansas.....	53,850	969	14,504	27	
California.....	158,360	1,968	49,608	31	
Colorado.....	103,925	105	33,131	32	
Connecticut.....	4,990	.....	4,990	100	
Delaware.....	2,050	.....	644	31	
District of Columbia.....	70	.....	70	100	
Florida.....	58,680	.....	1,821	3	
Georgia.....	59,475	.....	14,007	24	
Idaho.....	84,800	470	12,591	15	
Illinois.....	56,650	50	4,485	8	
Indiana.....	36,350	.....	143	.....
Indian Territory.....	31,400	.....	30,885	99	
Iowa.....	56,025	878	6,695	12	

*The present condition of topographic surveys and the new areas surveyed
in 1898-99—Continued.*

State or Territory.	Total area.	Area surveyed in 1898-99.	Area surveyed to date.	
	<i>Square miles.</i>	<i>Square miles.</i>	<i>Square miles.</i>	<i>Per cent.</i>
Kansas	82,080	1,652	62,746	76
Kentucky	40,400	167	10,433	26
Louisiana	48,720		7,492	15
Maine	33,040		3,810	12
Maryland	12,210	680	8,450	69
Massachusetts	8,315		8,315	100
Michigan	58,915	128	1,964	3
Minnesota	83,365	195	1,622	2
Mississippi	46,810		29	
Missouri	69,415	711	28,869	42
Montana	146,080	370	36,153	25
Nebraska	77,510	1,115	25,100	32
Nevada	110,700		28,949	26
New Hampshire	9,305		2,396	26
New Jersey	7,815		7,815	100
New Mexico	122,580		27,777	23
New York	49,170	3,345	18,392	37
North Carolina	52,250		12,252	23
North Dakota	70,795		6,327	9
Ohio	41,060	528	862	2
Oklahoma	39,030		4,146	11
Oregon	96,030	1,014	13,705	14
Pennsylvania	45,215	104	6,638	15
Rhode Island	1,250		1,250	100
South Carolina	30,570		3,900	13
South Dakota	77,650	826	16,273	21
Tennessee	42,050		17,641	42
Texas	265,780	750	58,427	22
Utah	84,970		62,867	74
Vermont	9,565		2,844	30
Virginia	42,450		29,227	69
Washington	69,180	2,487	6,458	9
West Virginia	24,780	140	17,026	69
Wisconsin	56,040	267	6,277	11
Wyoming	97,890	1,270	13,029	13
Total	3,024,880	20,189	804,888	27

DIVISION OF TRIANGULATION.

ATLANTIC SECTION.

Three 15-minute quadrangles in central New York were controlled by Mr. W. T. Griswold, topographer, in July and August, 1898, stations of the New York State survey and of the United States Lake Survey serving as bases for the work.

Mr. Griswold next proceeded to the Adirondack region and controlled three 15-minute quadrangles, based upon work of Mr. W. J. Peters of the preceding year, occupying five stations. Returning to central New York he controlled three additional quadrangles during October and November, occupying in this locality a total of fifteen stations. One meridian mark was established at Geneva.

An astronomic station was established at Waverly, Tennessee, by Mr. S. S. Gannett, topographer, in May, 1898, this station serving as a check on several hundred miles of primary traverse run during the two preceding years for control of the phosphate region.

In October Mr. Gannett measured and expanded a base near Columbus, Ohio, controlling the two 15-minute quadrangles in which Columbus is situated, occupying in connection therewith six triangulation stations.

Meridian lines were established at forty-three county seats in West Virginia, five of them by Mr. George T. Hawkins, topographer, the remainder by Mr. E. L. Faison, field assistant.

CENTRAL SECTION.

Primary railroad traverse was extended by Mr. George T. Hawkins from Carrington, North Dakota, northward along the Northern Pacific Railroad to Leeds, thence eastward along the Great Northern Railway to Crookston, Minnesota, thence northward along the same railway to the astronomic station on the international boundary near Pembina. A circuit was completed by continuing the line southward from Crookston to Fargo, so as to connect with previous work, the total distance traversed being 363 miles.

Meridian lines were established at eleven county seats.

In September Mr. Hawkins furnished additional control for the Cincinnati (Ohio) quadrangle by running 24 miles of traverse across its southern part. This control was supplemented by 20 miles of traverse run by Mr. W. J. Peters in January, 1899.

In October and November, 1898, Mr. Hawkins ran a primary traverse from the United States Coast and Geodetic Survey astronomic pier at Little Rock, Arkansas, along the St. Louis, Iron Mountain and Southern Railway to Texarkana, thence westward along the Kansas City, Pittsburg and Gulf Railroad, connecting with a station of the Arkansas triangulation of 1887. The distance traversed was 287 miles.

Meridians were established at six county seats.

ROCKY MOUNTAIN SECTION.

Mr. T. M. Bannon, topographer, during May and June, 1898, extended the triangulation from Uvalde, Texas, eastward to San Antonio, connecting in that vicinity with the triangulation executed by Prof. A. H. Thompson, geographer. In connection with this work thirteen new stations were selected and occupied and seven stations of previous work were reoccupied. This completed a belt of triangulation between the Austin and Spofford bases and astronomic stations.

In the spring of 1899 Professor Thompson extended triangulation control over the square degree between latitudes 33° and 34° and longitudes 111° and 112° , in Arizona; also over the Globe, Arizona, 15-minute quadrangle, occupying seventeen stations. A site for a base line near Maricopa was also selected.

PACIFIC SECTION.

Mr. S. S. Gannett, topographer, extended a belt of triangulation westward from stations in the Baker, Oregon, base expansion established the preceding year, so as to control three 30-minute quadrangles. Nine stations were occupied and seven were located by intersections.

INDIAN TERRITORY SECTION.

The triangulation of Indian Territory was extended over the Denison quadrangle, south of the Red River, under the

appropriation for resurveying lands of the Chickasaw Nation, Indian Territory, made available for this work by the deficiency act of June 7, 1898. The work was carried on from August 15 to October 1, under the direction of Mr. Jeremiah Ahern, surveyor. Five stations were established and final observations were taken. Five secondary stations were also located.

FOREST RESERVES.

Primary control for the mapping of the forest reserves was established as follows:

Rocky Mountain Section.

Black Hills Reserve, Wyoming-South Dakota—During May and June, 1898, Mr. R. H. Chapman, topographer, completed the work commenced in 1897 by reoccupying five old stations. He also established meridian lines at Custer, South Dakota, and Newcastle, Wyoming.

Teton Reserve, Wyoming.—Mr. T. M. Bannon, topographer, measured a base line 5 miles in length near Jacksons Lake, established six stations in the base expansion, added fifteen new stations, reoccupied eleven old stations, and connected the triangulation with the astronomic station near Outlet Lake, Yellowstone Park, established by the United States Coast and Geodetic Survey, thus completing a belt of triangulation extending from the Sheridan base and astronomic station to the Teton base and Yellowstone Park astronomic station.

Lewis and Clarke Reserve, Montana.—Mr. R. H. Chapman, topographer, selected eleven new stations and occupied four old ones between the Hamilton and Helena, Montana, bases and astronomic stations. This work was undertaken in order to check the control for the Lewis and Clarke and Bitterroot reserves. Owing to unfavorable weather, the final occupation of all the stations could not be completed before the end of the season.

Flathead Reserve, Montana.—Prof. A. H. Thompson, geographer, selected and occupied ten stations along the eastern border of this reserve and connected the same with one of the astronomic stations on the forty-ninth parallel.

Uinta Reserve, Utah.—Mr. H. L. Baldwin, jr., topographer, completed the horizontal control for this reserve and established a point on the thirty-third meridian west from Washington at its intersection with the forty-first parallel, being a point on the line between Uinta and Sweetwater counties, Wyoming. Fourteen new stations were added for the control of the reserve.

Pacific Section.

Priest River Reserve, Idaho.—Mr. E. T. Perkins, jr., topographer, extended his work of the preceding year northward to the international boundary line, occupying nine new stations and reoccupying four old ones.

Washington Reserve, Washington.—Primary triangulation was extended over a portion of this reserve during July, August, and September, 1898, by Mr. A. H. Sylvester, assistant topographer, who occupied six new stations and reoccupied three old ones.

Mount Rainier Reserve, Washington.—Mr. A. H. Sylvester, assistant topographer, during a portion of April and May, 1899, extended triangulation southward from the vicinity of Ellensburg, so as to control the Yakima quadrangle. Five new stations were established and occupied.

San Bernardino Reserve, California.—During November and December, 1898, Mr. A. H. Sylvester, assistant topographer, extended triangulation northward from Box Springs and Elsinore, stations established by Mr. A. P. Davis, topographer, in 1892, so as to control three 15-minute quadrangles. Eleven stations were occupied in this connection.

San Bernardino and San Gabriel Reserves, California.—Mr. E. T. Perkins, jr., topographer, was sent to the field early in April for the purpose of completing the triangulation control for these two reserves. This work was successfully accomplished, the work of Messrs. Sylvester and Gannett of previous seasons being connected. Seven new stations were established and occupied and five old stations were reoccupied.

IDAHO-MONTANA BOUNDARY LINE.

The triangulation in connection with the Idaho-Montana boundary line having been extended during the preceding

season sufficiently to locate several points in the vicinity of the line, the survey of a random line northward from the crest of the Bitterroot Mountains was the next step. Mr. S. S. Gannett, topographer, proceeded to the field in this connection about the middle of June, and after observing for azimuth at Clark Fork, Idaho, made a reconnaissance of the country in the vicinity of triangulation station Divide for the purpose of ascertaining the feasibility of running a traverse line along the summit of the Bitterroot Mountains, so as to get a point in the line of the meridian corresponding to the boundary line. In order to establish this initial point in the boundary, namely, the intersection of the meridian $116^{\circ} 03' 02.30''$ west of Greenwich with the summit of the Bitterroot Mountains, it was necessary to traverse a distance corresponding to 6,072 feet in longitude. This traversing was done by Mr. Gannett, assisted by Mr. D. L. Reaburn, traverseman, distances having been measured by chain and checked by stadia, and directions being controlled by azimuth observations at the beginning and end of the traverse line. After this initial point had been established the party was under the charge of Mr. Reaburn throughout the remaining portion of the season. Very rough country was found along the entire line, and toward the latter part of the season a great deal of snow was encountered on the high ridges, the party narrowly escaping being snowed in without provisions. The survey of the random line was completed on October 31 in snow $2\frac{1}{2}$ feet deep.

Horizontal and vertical distances were obtained by stadia measurement along the entire line, the horizontal distances being checked by the triangulation and the differences of elevation by the profiles of the Northern Pacific and Great Northern railroads. The total rise and fall of the boundary line was 63,000 feet; the average length of sights, 353 feet; distance run, about 72 miles; number of transit stations, 1,051, and number of azimuth stations, 17. During the office season the connections between various points on the line and the adjacent triangulation stations were computed, and it now only remains to swing the line to its true position and to place the necessary monuments.

DIVISION OF TOPOGRAPHY.

ATLANTIC SECTION.

Mr. H. M. Wilson, geographer, remained in charge of this section. Topographic work was carried on during the season by thirteen parties, working in eleven States; namely, Alabama, Georgia, Kentucky, Maryland, Massachusetts, New Jersey, New York, North Carolina, Ohio, Pennsylvania, and West Virginia. In addition, one party was employed throughout the summer in running precise levels in New York State and during the winter in Georgia. The survey of twenty-three quadrangles was completed, of which twenty-one were on the scale of 1:62500 and two on the scale of 1:125000. In addition, the survey of ten quadrangles was partially completed, of which two were on the scale of 1:125000. The resurvey of 155 square miles in the neighborhood of Boston was completed on a scale of 1:20000 and a large-scale special map of the zinc mines of Franklin Furnace, New Jersey, was made on a scale of 1,200 feet to the inch, the area covered being 4 square miles. The total area surveyed was 6,756 square miles, of which 4,502 square miles were on the scale of 1:62500, and 2,254 square miles on the scale of 1:125000, the remainder being on the larger special scales. Levels were run over 2,786 linear miles, resulting in the establishment of 334 permanent bench marks.

Massachusetts.—Field work was commenced on a large-scale resurvey of Boston and vicinity early in July by Mr. Frank Sutton, topographer, assisted by Mr. J. W. Thom, topographer, and for a short time by Mr. J. H. Jennings, topographer. The greater portion of the work of this party was the compilation of existing data from the United States Coast and Geodetic Survey, the surveys of the Metropolitan Water Board, Sewage and Park commissions, and such other surveys of numerous towns and cities and private properties as were procurable. The scale of field work was 1:20000 and the contour interval was 20 feet. The result of the season's operations was the partial completion of the work undertaken and the survey of the total area in detached portions of 155 square miles. No primary levels were run, because of the existence of so large

an amount of leveling by city authorities, but 17 miles of secondary spirit leveling was done.

New York.—Work was carried on under the cooperative topographic agreement made with the State engineer of New York, whereby that State appropriated \$25,000 for the work and the Director of the United States Geological Survey allotted a like amount. There were maintained on such work during the season seven separate parties. Mr. Frank Sutton, topographer, assisted by Messrs. J. W. Thom, topographer, and Glenn S. Smith, assistant topographer, commenced field work on the Dunkirk, Cherry Creek, Westfield, and Silver Creek quadrangles toward the end of April. Messrs. Sutton and Thom went to Massachusetts on the 1st of July, leaving Mr. Smith in charge of this work for the remainder of the season. All the sheets above named were completed prior to the disbandment of this party in the fall. Mr. A. M. Walker, topographer, assisted by Mr. A. H. Bumstead, assistant topographer, completed the survey of the Canada Lakes quadrangle and the revision of a portion of the Old Forge quadrangle. Mr. W. H. Lovell, topographer, completed the survey of the Schuylerville and Wilmurt quadrangles and aided Mr. Bassett in the survey of the Little Falls quadrangle. Mr. C. C. Bassett, topographer, completed the survey of the Schoharie and Canajoharie quadrangles and assisted in the completion of the survey of the Little Falls quadrangle. Mr. R. D. Cummin, topographer, assisted by Mr. N. G. Van Doren, assistant topographer, completed the survey of the Watkins and Dryden quadrangles and completed the control for the survey of the Waverly quadrangle. Mr. E. B. Clark, topographer, completed the survey of the Oswego, Baldwinsville, and Fulton quadrangles and executed a portion of the control for the Weedsport quadrangle. Mr. J. H. Wheat, topographer, completed the survey of the Macedon quadrangle, besides about 110 square miles of the Newark quadrangle and the larger portion of the control of the Lyons quadrangle. All of these parties commenced field work early in the month of April. In addition, Messrs. W. L. Miller and Hersey Munroe, topographers, and Albert Pike, assistant topographer, spent the months of May and June in surveying

portions of the Little Falls, Canajoharie, and Wilmurt quadrangles, respectively. The work executed in New York was on a scale of 1:62500, with a contour interval of 20 feet, and embraced an area of 3,345 square miles. In connection with the above 1,498 miles of primary and precise levels were run and 160 permanent bench marks were established.

On April 1 Mr. E. L. McNair commenced the running of a line of precise levels between United States engineers' bench mark of the Lake Survey at Dunkirk and United States Coast and Geodetic Survey grist mill bench mark near Albany. The route of these levels was over the lines of the Erie and the Delaware and Hudson railways. This precise leveling was completed after running 442 linear miles, in which distance there were established 63 permanent bench marks. The details of the closures on the work of the United States engineers and of the United States Coast and Geodetic Survey and a discussion of the results are published under the appropriate State title in the Appendix to this report.

Maryland-Pennsylvania-West Virginia.—Work was prosecuted under the cooperative topographic agreement made with the State geologist of Maryland, whereby that State appropriated \$5,000 and the Director of the United States Geological Survey allotted a like amount. The portions of Pennsylvania and West Virginia surveyed in connection with the filling out of quadrangular areas were mapped exclusively at the expense of the Federal Government. Mr. J. H. Jennings, topographer, assisted by Mr. W. C. Hall, topographer, and W. N. Morrill, assistant topographer, commenced field work early in April. The Flintstone quadrangle, for which control was executed during the preceding season, was completely surveyed. In addition, the survey was completed of the Grantsville, Accident, and Pawpaw quadrangles, and traversing and spirit leveling were completed for partial control of the Hancock quadrangle and a portion of the Oakland quadrangle. The work was on a scale of 1:62500, with a contour interval of 20 feet, and embraced an area of 924 square miles, in connection with which 178 miles of spirit levels were run and 17 permanent bench marks were established.

Ohio-Kentucky.—Mr. Hersey Munroe, topographer, assisted for a portion of the season by Mr. W. N. Morrill, assistant topographer, commenced field work after his transfer from New York State early in July, and completed the survey of the Iron-ton quadrangle. The scale of work was 1:62500, with a contour interval of 20 feet. An area of 233 square miles was mapped, in connection with which 64 miles of spirit levels were run and 9 permanent bench marks were established.

New Jersey.—Mr. Albert Pike, topographer, commenced field work early in May, on a large-scale topographic map of the vicinity of Franklin, New Jersey. This work was completed in June, when Mr. Pike moved temporarily to New York. In New Jersey a survey was made of 4 square miles on a scale of 1,000 feet to 1 inch, with a contour interval of 10 feet.

West Virginia.—Mr. Albert Pike, topographer, on the completion of his New York work, commenced field work in this State on July 1 and made a resurvey of a portion of the Nicholas quadrangle. In all he mapped 443 square miles on a scale of 1:125000 and with a contour interval of 100 feet. In connection with this work 130 linear miles of levels were run and 19 permanent bench marks were established.

North Carolina.—Mr. W. L. Miller, topographer, on July 1, was transferred from New York State and took charge of the resurvey of the Asheville quadrangle. During the season he completed the survey of 443 square miles on a scale of 1:125000 and with a contour interval of 100 feet. In connection with this surveying 127 miles of spirit levels were run and 14 permanent bench marks were established.

Alabama.—During the first week in September Mr. J. W. Thom, topographer, was transferred from Massachusetts and assigned to the duty of completing the resurvey of the Fort Payne quadrangle. He was assisted in this for a portion of the season by Messrs. Hersey Munroe, topographer, and N. G. Van Doren and A. H. Bumstead, assistant topographers. This party mapped during the season 626 square miles on a scale of 1:125000, with a contour interval of 50 feet, thus completing the unsurveyed portions of the quadrangle.

In connection with this surveying 31 linear miles of spirit levels were run and 5 permanent bench marks were established. During the first week in September Mr. W. C. Hall, topographer, was transferred from Maryland and took charge of the resurvey of the unmapped portion of the Anniston quadrangle. In this work he was assisted for a portion of the time by Mr. W. N. Brown, assistant topographer. This party surveyed during the season 742 square miles on a scale of 1:125000 and with a contour interval of 50 feet, thus completing the survey of the unmapped portions of this quadrangle. Nineteen miles of levels were run and 3 permanent bench marks were established.

Georgia.—Mr. E. L. McNair, levelman, was transferred from New York State early in October, when he took up in Atlanta the continuation of the line of precise levels brought during the two previous seasons by Mr. W. C. Hall from Morehead City, North Carolina, via Asheville and Knoxville, to Atlanta. By the latter part of January he completed this line to a bench mark at mean sea level in Brunswick, Georgia. He ran in all 280 miles of precise levels and established 44 permanent bench marks. The details of the closure errors and adjustments of this full line of precise levels are recited under the appropriate State name in the Appendix to this report.

CENTRAL SECTION.

Mr. John H. Renshaw, geographer, remained in charge of this section. Eight topographic parties were maintained during the season, working in the districts of Minnesota, Michigan, South Dakota-Nebraska, Iowa, Iowa-Wisconsin, Wisconsin, Ohio-Kentucky, Nebraska, Kansas, Arkansas, and Missouri-Illinois. One level party was employed during the winter in Oklahoma. Ten quadrangles were surveyed, also an irregular area of 128 square miles in the vicinity of Iron Mountain, Michigan, and work in the Vermilion Iron Range of northern Minnesota, covering 195 square miles, was completed. In addition to the regular topographic work the culture of a large district in eastern Iowa, including an area of about 4,500 square miles, was revised, preparatory to publication, on the

reduced scale of 1:125000. The total area surveyed was 7,039 square miles, of which 1,002 square miles were on a scale of 1:62500 and 6,037 square miles on a scale of 1:125000. Levels were run over 1,685 linear miles, resulting in the establishment of 198 permanent bench marks.

Michigan.—Field work was commenced in this State early in May by a party in charge of Mr. E. C. Bebb, assistant topographer, and was continued until about the middle of July, when the area assigned was completed and Mr. Bebb and his party were transferred to the Vermilion iron range of Minnesota. The area covered in Michigan was 128 square miles, surveyed on a scale of 1:62500, with a contour interval of 20 feet. The district surveyed lies along the iron range in the vicinity of Iron Mountain. In connection with this work 102 miles of spirit levels were run and 5 permanent bench marks were established.

Minnesota.—Upon the completion of work in the Iron Mountain district of Michigan, about the middle of July, the party under the charge of Mr. E. C. Bebb resumed operations in the Vermilion iron range, beginning at the point where work was stopped last season, about 20 miles east of Ely. Work was continued until early in November, when the district was completed and the party disbanded. During the season 195 square miles were surveyed on a scale of 1:62500, with a contour interval of 20 feet, the area extending in a narrow strip eastward along the range until the Canadian line was reached. In connection with this work about 131 miles of spirit levels were run.

South Dakota-Nebraska-Iowa.—Field work was resumed in this district by Mr. W. H. Griffin, topographer, assisted by Mr. Basil Duke, topographer, about the middle of May and was continued until early in September, when the party was transferred to southern Wisconsin. The district surveyed lies in the vicinity of Elk Point, in the lower valley of the James River and along the valley of the Missouri River, extending into Nebraska, in parts of Clay and Union counties, South Dakota; in Dixon and Dakota counties, Nebraska, and in Plymouth County, Iowa, and adjoins on the north the work of previous years. The area surveyed was 878 square miles,

on a scale of 1:125000, with a contour interval of 20 feet, and in connection with the topographic work 221 miles of spirit levels were run and 23 permanent bench marks were established.

Wisconsin.—Upon the completion of the work above referred to, Mr. W. H. Griffin, with his party, commenced operations on the Denzer quadrangle of southern Wisconsin, lying in Sauk County, and continued until the latter part of November, when the party was disbanded and returned to the Washington office. During the time work was carried on in Wisconsin 217 square miles were surveyed on a scale of 1:62500, with a contour interval of 20 feet, and in connection with the topographic work 92 miles of spirit levels were run and 10 permanent bench marks were established.

Iowa-Wisconsin.—Work was continued in this district by Mr. R. C. McKinney, topographer, from about the middle of June until early in November, when the party was disbanded and returned to the Washington office. The survey of the Elkader quadrangle was completed. The district surveyed lies in the Mississippi Valley, in Clayton, Delaware, and Dubuque counties, Iowa, and Grant County, Wisconsin, adjoining the work of previous seasons on the east and south, and covers an area of 878 square miles. The scale was 1:125000, with a contour interval of 20 feet. In connection with this work 239 miles of levels were run and 23 permanent bench marks were established.

Nebraska.—Field work was resumed in the western part of the State about July 15, and continued until early in November, by a party in charge of Mr. M. Hackett, topographer, with Mr. C. W. Goodlove, topographer, as assistant. During the season the Paxton quadrangle was surveyed, lying in parts of Arthur, McPherson, and Keith counties, embracing an area of 899 square miles, on a scale of 1:125000, with a contour interval of 20 feet, in connection with which 218 miles of levels were run and 44 permanent bench marks were established. Upon the completion of this work the party was disbanded, and Mr. Hackett and his assistant returned to Washington.

Kansas.—Field work was commenced about June 1, by

a party in charge of Mr. Nat Tyler, jr., topographer, and was continued until early in September, when the party was disbanded and Mr. Tyler was detailed to revision work in eastern Iowa. During the time work was carried on in Kansas the Syracuse quadrangle was surveyed and the Lakin quadrangle was completed, the northeast quarter of which had been previously surveyed by Mr. W. H. Herron. The district surveyed lies in the Arkansas Valley, in parts of Hamilton, Stanton, Kearney, Finney, Grant, and Haskell counties, and comprises an area of 1,652 square miles. The scale of the work was 1:125000, with a contour interval of 20 feet, and in connection with the topographic work 116 miles of levels were run and 38 permanent bench marks were established.

Missouri-Illinois.—Field work was resumed in this district early in September, by Mr. Paul Holman and party, and was continued until about December 1, when the O'Fallon quadrangle, commenced the previous season, was completed, Mr. Holman then returning to the Washington office. This quadrangle is situated in the lower valleys of the Missouri and Mississippi rivers and extends across the river into Illinois, lying in parts of St. Louis, St. Charles, Lincoln, and Franklin counties, Missouri, and Calhoun County, Illinois. The area surveyed during the field season was 761 square miles, on a scale of 1:125000, with a contour interval of 50 feet. In connection with this work 111 miles of levels were run and 21 permanent bench marks were established.

Arkansas.—Field work was commenced in this district by a party in charge of Mr. H. B. Blair, topographer, with Mr. Duncan Hannegan as assistant, about June 1 and was continued until about the middle of November, during which time the Winslow quadrangle was surveyed, lying in the Boston Mountains, in parts of Washington, Crawford, and Franklin counties, embracing an area of 969 square miles. The work was done on a scale of 1:125000, with a contour interval of 50 feet, and in connection with it 265 miles of levels were run and 22 permanent bench marks were established.

Ohio-Kentucky.—Field work was commenced in this district early in September, by a party in charge of Mr. Charles E.

Cooke, topographer, and continued until about February 1, during which time the quadrangles comprising the city of Cincinnati and vicinity and extending across the Ohio River into Kentucky were surveyed. The area surveyed was 462 square miles, on a scale of 1:62500, with a contour interval of 20 feet, and in connection with the topographic work 190 miles of levels were run and 12 permanent bench marks were established.

ROCKY MOUNTAIN SECTION.

This section remained throughout the year, as heretofore, under the direction of Mr. E. M. Douglas, geographer. Topographic work was carried on by two parties in South Dakota, three in Wyoming, one in Montana, one in Colorado, and two in Texas. Up to May 1, 1,270 square miles were surveyed, of which 120 square miles were on the scale of 1:62500, 1,115 square miles were on the scale of 1:125000, and 35 square miles were on the special scale of 1:23600. There was a total of 750 miles of levels run and 154 permanent bench marks were established.

Montana.—Mr. W. J. Lloyd, topographer, commenced field work on July 6, and completed the Helena special quadrangle, in Lewis and Clarke County, about the middle of October. He surveyed 50 square miles on a scale of 1:62500, with a contour interval of 50 feet. Mr. Lloyd also mapped 90 square miles of the Missoula quadrangle, in Missoula County, on a scale of 1:125000, with a contour interval of 100 feet, and did considerable preliminary work in the latter area. In connection with the Missoula quadrangle 267 miles of levels were run and 18 permanent bench marks were established.

Colorado.—Mr. W. M. Beaman, topographer, commenced work on July 12, and mapped 35 square miles in the vicinity of Rico, in Dolores County, on a scale of 1:23600, with a contour interval of 50 feet. On the completion of this work, on September 20, he began the survey of the Engineer Mountain quadrangle, in Dolores and San Juan counties, and practically completed the same early in November. The area surveyed amounted to 70 square miles, on a scale of 1:62500, with a contour interval of 100 feet. In connection with the work on

the two areas above referred to, 56 miles of levels were run and 13 permanent bench marks were established.

Texas.—Work was commenced on the resurvey of the Llano quadrangle, in Llano and Mason counties, by Mr. Arthur Stiles, assistant topographer, in October, 1898. Previous to May 1, 625 square miles of the quadrangle had been surveyed on the scale of 1:125000, with a contour interval of 50 feet.

Mr. G. E. Hyde, topographer, commenced the resurvey of the Bastrop quadrangle, in Bastrop, Travis, Lee, and Williamson counties, on February 14, and up to May 1 had completed an area of 400 square miles on a scale of 1:125000, with a contour interval of 25 feet. For the control of the Llano and Burnet quadrangles 427 miles of levels were run and 123 bench marks were established.

Arizona.—Leveling for control of the Florence and Tempe quadrangles, in Pinal and Maricopa counties, was commenced April 26.

PACIFIC SECTION.

Mr. Richard U. Goode, geographer, remained in charge of this section throughout the fiscal year. On July 1, Messrs. R. H. McKee, Van H. Manning, and Robert A. Farmer, topographers, were transferred from the Indian Territory section to the Pacific section. Topographic work with leveling was carried on in Oregon, Washington, Idaho, and California by six parties. The area surveyed embraced 2,315 square miles, all of which was on the scale of 1:125000, with a contour interval of 100 feet. There was a total of 851 miles of spirit levels run, in connection with which 174 permanent bench marks were established.

Washington-Idaho.—Mr. Van H. Manning, topographer, was detailed for the survey of the Spokane quadrangle. The necessary camp equipment and animals were sent by freight from Denison, Texas, and topographic surveying was commenced about July 20. The entire quadrangle was mapped during the field season, work having been completed about November 15. The area surveyed amounted to 805 square miles, partly in Spokane County, Washington, and partly in Kootenai County, Idaho. The scale of the work was 1:125000, with a

contour interval of 100 feet. In connection with the topographic mapping 303 miles of spirit levels were run and 44 permanent bench marks were established.

Oregon.—Mr. R. H. McKee, topographer, was detailed for the survey of the Baker City quadrangle, in Baker and Union counties. He was engaged on this work from the middle of July until the middle of November, when the party was disbanded on account of snow and cold weather. An area of 625 square miles on the scale of 1:125000, with a contour interval of 100 feet, was surveyed. In connection with this work 150 miles of levels were run and 22 permanent bench marks were established.

Mr. A. E. Murlin, topographer, left Washington May 1 for the purpose of resuming field work on the Port Orford quadrangle. The survey of this quadrangle was completed by the last of September, the area covered amounting to 389 square miles, in Coos and Curry counties, on a scale of 1:125000, with a contour interval of 100 feet. In connection with this work 70 miles of spirit levels were run and 20 permanent bench marks were established. Upon the completion of the work in Oregon Mr. Murlin was directed to proceed to Sacramento, California, for the purpose of compiling certain information on file in the office of the chief engineer of public works, relating to elevations in the San Joaquin Valley. Upon the completion of this work Mr. Murlin was directed to proceed to Washington, District of Columbia, for office duty.

Upon the completion of the work of Mr. Manning's party in the vicinity of Spokane, Mr. J. H. Carlock, levelman, was detailed for the purpose of running a line of levels with duplicate rods from a United States Coast and Geodetic Survey bench mark referred to mean sea level at Astoria eastward along the lines of the Astoria and Columbia River Railroad and the Oregon Railway and Navigation Company. The work progressed as far as the vicinity of Arlington, when Mr. Carlock was reassigned to Mr. Manning's party for work on the Cœur d'Alène quadrangle. The result of Mr. Carlock's work was 244 miles of levels, in connection with which 52 permanent bench marks were established.

California.—Upon the conclusion of certain work in the Sierra, referred to under the heading "Forest reserves" (p. 124), Mr. R. B. Marshall, topographer, proceeded to southern California the latter part of October and began work on the southern half of the Elsinore quadrangle, in Orange and Riverside counties. The mapping of this area was completed about December 20, with the exception of a portion of the traversing, which extended through the month of January. The area surveyed embraced 496 square miles, on a scale of 1:125000, with a contour interval of 100 feet. The leveling was completed during the preceding season.

During the months of July and August Mr. G. H. Herrold extended the line of precise levels which had been previously brought from a tidal bench mark at San Pedro, via Los Angeles and San Bernardino to Temecula, a satisfactory check being obtained on another bench mark referred to mean tide in the vicinity of San Diego. The line was 84 miles in length and 36 permanent bench marks were established.

FOREST RESERVES.

The organization continued as heretofore, certain reserves being assigned to the Rocky Mountain topographic section, under Mr. E. M. Douglas, geographer, and the remaining reserves being assigned to the Pacific section, under Mr. Richard U. Goode, geographer.

Rocky Mountain Section.

Topographic or subdivisional work was prosecuted in three reserves—Black Hills, Bighorn, and Lewis and Clarke. Two hundred and fourteen square miles were mapped on a scale of 1:62500, and 1,954 square miles on a scale of 1:125000. In connection with the above, 524 miles of levels were run and 145 permanent bench marks were established. Subdivisional and exterior work is summarized as follows: Standard lines, 13 miles; township lines, 76 miles; section lines, 926 miles; town-site lines, 4 miles.

Black Hills Reserve, South Dakota-Wyoming.—Mr. W. H. Herron, topographer, between July 7 and November 13, surveyed an area of 214 square miles on a scale of 1:62500, with

a contour interval of 50 feet, thereby completing the Spearfish quadrangle, the area surveyed being in Lawrence County. In addition to the leveling work completed in 1897 for this area, 20 miles of levels were run and 7 permanent bench marks were established.

Topographic work under Mr. A. F. Dunnington, topographer, was commenced on June 12 and continued until November 20. The work consisted of a resurvey of portions of the Deadwood, Harney Peak, and Hermosa quadrangles, in Custer and Pennington counties. One level party and three subdivisional parties were also engaged in this reserve, under the direction of Mr. Dunnington. The scale of the topographic work was 1:125000, with a contour interval of 100 feet. Five hundred and eighty square miles were mapped, in connection with which 102 miles of levels were run and 32 permanent bench marks were established.

Mr. W. J. Lloyd, topographer, after the completion of the work in Montana previously referred to (p. 116), mapped 104 miles of the Rapid City quadrangle, in Pennington County.

The subdivisional work in this locality was as follows: Six miles of standard lines, 54 miles of township lines, 822 miles of section lines, and 4 miles of town-site lines.

Bighorn Reserve, Wyoming.—Mr. Frank Tweedy, topographer, commenced work on the Bald Mountain quadrangle on June 12; Mr. F. E. Matthes, assistant topographer, commenced work on the Cloud Peak quadrangle on July 23, and Mr. C. F. Urquhart, topographer, commenced work on the resurvey of the forest-reserve portion of the Dayton quadrangle on July 16. Two level parties were also at work in this area during the entire season, which closed October 30 on account of the heavy snow in the mountains. The total output of these parties amounted to 1,270 square miles of topographic mapping on a scale of 1:125000, with a contour interval of 100 feet. Three hundred and fifty miles of levels were run and 85 permanent bench marks were established. At the close of the work in this reserve Mr. Matthes assisted Mr. Herron in the Black Hills Forest Reserve for a short time.

Lewis and Clarke Reserve, Montana.—Mr. W. H. Thorn, sur-

veyor, from August 8 to October 22, surveyed 7 miles of standard lines, 22 miles of township lines, and 104 miles of section lines in or adjacent to this reserve.

Uinta Reserve, Utah.—Mr. Edward O. Hills, levelman, ran 52 miles of level lines and established 21 bench marks in this reserve.

Pacific Section.

Topographic or subdivisional work was continued or commenced in or near the following reserves: Bitterroot, Priest River, Washington, Cascade Range, Sierra, Stanislaus, San Bernardino, San Gabriel, San Jacinto, and Trabuco Canyon. The total area surveyed topographically amounted to 3,854 square miles, of which 3,360 square miles were on the scale of 1:125000, with a contour interval of 100 feet, and 494 square miles were on the scale of 1:62500, with a contour interval of 50 feet. In connection with the above, 1,772 miles of spirit levels were run and 298 permanent bench marks were established. The subdivisional and exterior work is summarized as follows: Standard lines, 4 miles; township lines, 5 miles; subdivisional lines, 100 miles; retracement lines, 10½ miles.

Bitterroot Reserve, Montana-Idaho.—Topographic mapping was continued in this reserve by Mr. A. B. Searle, topographer, who commenced work early in August and completed the survey of the Hamilton quadrangle about November 15. The area surveyed embraced 230 square miles on the scale of 1:125000, with a contour interval of 100 feet, in Ravalli County, Montana. The necessary leveling was completed during the preceding season.

Mr. W. A. Lindsay, surveyor, was detailed to examine various townships in and adjacent to the Bitterroot Reserve and to execute such subdivisional surveys as were necessary to include the agricultural lands and lands on which settlements had been made in good faith. Portions of the following townships were subdivided: T. 1 N., R. 20 W.; T. 1 N., R. 21 W.; T. 2 N., R. 21 W., and T. 3 N., R. 21 W. The total number of miles surveyed were: Township lines, 3½ miles; subdivisional lines, 21½ miles, and retracement lines, 1½ miles. Considerable time was spent by Mr. Lindsay in making exam-

inations of tracts of land for which applications for surveys had been submitted, but which upon examination proved to possess too little agricultural value to warrant a survey. Upon the completion of the work above referred to, in the early part of September, Mr. Lindsay was directed to proceed to Tucson, Arizona, and report to Mr. W. Lindgren, geologist, in connection with the survey of certain lands involved in the case of the United States against Neall and the Mohawk Mining Company. After this special work was completed Mr. Lindsay reported to Mr. C. H. Fitch at Denison, Texas, for the purpose of writing up the land-survey notes and preparing the necessary plats.

Priest River Reserve, Idaho.—Topographic work was commenced by Mr. D. C. Harrison, topographer, on the Sand Point quadrangle, in Kootenai County, Idaho, about the middle of July and was continued until November 15, when the party was disbanded on account of continued unfavorable weather. Mr. Harrison was on leave during the month of August on account of the death in the East of a member of his immediate family, but the traverse and level work was continuous throughout the season. An area of 400 square miles was surveyed on a scale of 1:125000, with a contour interval of 100 feet, in connection with which 179 miles of spirit levels were run and 18 permanent bench marks were established.

Washington Reserve, Washington.—Topographic work was continued within and adjacent to this reserve by four topographic parties and one independent level party.

Mr. Robert A. Farmer, topographer, was detailed for the survey of the Waterville quadrangle, in Douglas and Okanogan counties, and commenced operations in the latter part of July. A portion of the quadrangle adjacent to Lake Chelan had been surveyed the previous year. The entire quadrangle was completed on October 15, an area of 579 square miles having been surveyed during the season on a scale of 1:125000, with a contour interval of 100 feet. In connection with this work 138 miles of levels were run and 22 permanent bench marks were established.

Mr. G. E. Hyde, topographer, having taken the field on May 1, as noted in the last annual report, was engaged throughout the season, ending the last of October, on the Snoqualmie and Skykomish quadrangles, in Kittitas, King, Snohomish, and Okanogan counties. The Snoqualmie quadrangle was completed and about two-thirds of the Skykomish quadrangle was surveyed, the total area covered amounting to 500 square miles, on a scale of 1:125000, with a contour interval of 100 feet. In connection with the above, 150 miles of levels were run and 23 permanent bench marks were established. Mr. Hyde was engaged in office work in Washington after the termination of the field season, until January 31, when he was transferred to the Rocky Mountain section.

Work was commenced on the Sauk and Stillaguamish quadrangles by Messrs. L. C. Fletcher and T. G. Gerdine, topographers. The parties took the field the latter part of June. Smoke from forest fires during the summer greatly retarded the work, which was discontinued early in October, heavy rains preventing further proceedings in the lower country and heavy snow having fallen in the higher mountains. Six hundred and seventy-three square miles in Skagit, Snohomish, and Okanogan counties were mapped during the season on a scale of 1:125000, with a contour interval of 100 feet. The level lines were continued over the remaining area in these quadrangles and were connected with a tidal bench mark of the United States Coast and Geodetic Survey at Tulalip Bay. One hundred and sixty-eight miles of levels were run, in connection with which 23 permanent bench marks were established. In addition to the spirit-level elevations, other elevations were determined by vertical angulation and properly marked on bolts set into the solid rock on summits used as plane-table stations.

In order to supply an adequate vertical control for the work in the Washington and other reserves adjacent to the Northern Pacific Railway, a line of levels was started from mean sea level at Tacoma and extended across the States of Washington and Idaho to Missoula, Montana, a distance of 657 miles. In connection with this work 135 permanent bench marks were

established. This work was done by Mr. H. S. Crowe, levelman.

Cascade Range Reserve, Oregon.—No topographic work was done in this reserve, but in response to petitions by settlers the subdivision of T. 3 S., R. 7 E., Willamette meridian, was completed by Mr. Sledge Tatum, surveyor. This work required the survey of 28 miles and the retracement of 4 miles. Mr. Tatum was occupied on this work from August 1 to September 12, after which he proceeded to California to do similar work.

Reserves in California.—After suspension of work in Washington, Messrs. Fletcher and Gerdine were transferred to southern California. Work was immediately begun on the San Luis Rey quadrangle, which embraced territory adjacent to the Trabuco Canyon and San Jacinto forest reserves, in San Diego and Riverside counties. The work on this quadrangle was completed the last of December, an area of 505 square miles having been mapped on the scale of 1:125000, with a contour interval of 100 feet. In connection with this work 102 miles of levels were run and 26 permanent bench marks were established. The southern half of this quadrangle had been mapped in 1891 on a scale of 1:62500, and it was found necessary to revise the culture over this portion to bring the previous surveys up to date. Mr. Fletcher's work, on the scale of 1:125000, was combined with the two sheets previously mapped on a scale of 1:62500, and these were published as one sheet on the scale of 1:125000.

Mr. R. B. Marshall, topographer, was detailed for the survey of the Mount Lyell quadrangle, which lies on both sides of the Sierra, including portions of the Yosemite National Park and areas which will be involved when the fixation of the boundary of the Stanislaus Reserve is finally considered. Mr. Marshall commenced field work about the middle of July, and operations were continued until about October 15, which was as late as the weather conditions permitted work. Four hundred and seventy-three miles were mapped, in Mono, Tuolumne, and Mariposa counties. In connection with the above, 134 miles of levels were run and 34 permanent bench marks were

established. The work was on a scale of 1:125000, with a contour interval of 100 feet. Upon the discontinuance of the work above referred to, Mr. Marshall proceeded to southern California and was engaged as previously indicated until the completion of the field season.

Upon the completion of the work on the Spokane (Washington) quadrangle, Mr. W. T. Turner, who had been a field assistant attached to the Spokane party, was detailed to take charge of an independent party for the purpose of mapping portions of the San Bernardino and San Gabriel timber land reserves, in southern California. He commenced operations early in December and was engaged throughout the winter and spring, completing the Hesperia and Deep Creek quadrangles, embracing an area of 494 square miles, on a scale of 1:62500, with a contour interval of 50 feet. In connection with the above, 244 miles of levels were run and 17 permanent bench marks were established.

Subdivisional work was done by Mr. Sledge Tatum in the following localities: Adjacent to the Sierra Reserve, in T. 17 S., R. 29 E., and T. 20 S., R. 31 E., Mount Diablo meridian, between November 6 and 16, the total number of miles being, standard lines 4 miles, township lines 1 mile, subdivisional lines 2 miles, and retracement lines 1 mile; in the San Gabriel Timber Land Reserve, between September 29 and November 1, and November 19 and December 17, in T. 1 N., R. 14 W.; T. 2 N., R. 14 W.; T. 3 N., R. 14 W., San Bernardino meridian, the total number of miles surveyed being, township lines one-half mile, subdivisional lines 49 miles, and retracement lines 4 miles.

INDIAN TERRITORY SECTION.

Mr. C. H. Fitch, topographer, continued in charge of this section.

The field work of the subdivision of the lands in Indian Territory having been completed June 30, 1898, the field parties were disbanded and the regular employees of the Survey, Messrs. Van H. Manning, C. F. Urquhart, R. H. McKee, R. A. Farmer, C. W. Goodlove, and Duncan Hannegan, were transferred to other sections. As will appear elsewhere in the

report, topographic field work was extended from Indian Territory into the State of Texas, in the Denison quadrangle.

The Indian act approved July 1, 1898, gave authority to use any remainder of the appropriation for resurveying the Chickasaw lands for office and field expenses of said work during the fiscal year ending June 30, 1899. Under this authority the office work in connection with the Indian Territory section was continued at the headquarters at Denison, Texas. From July 1, 1898, to January 1, 1899, notes of 338 townships were transcribed, and typewritten copies in triplicate were made of 490 townships, and township and exterior plats were drawn to the number of 278, completing the office work of the land survey.

The final drawing of 26 topographic sheets has been completed since the beginning of the work; 14 have been completed during the year.

The deficiency act of July 7, 1898, provides that any balance of the appropriation of \$141,500 provided in the Indian act approved June 7, 1897, for resurveying the lands of the Chickasaw Nation, Indian Territory, that may not be necessary for the completion of said resurvey may be used for topographic surveys in the State of Texas, in order to complete the topographic sheets of the Indian Territory extending into Texas, to continue available until the close of the fiscal year 1899. Under this authority operations were commenced about the middle of August on the Texas side of the Red River, in the Denison quadrangle, by Mr. Jeremiah Ahern, surveyor. The triangulation and level work extended from the middle of August to October 1, and the topographic work from October 1 to December 31, when the mapping of the Denison quadrangle was completed, the area covered being 750 square miles, on a scale of 1:125000, with a contour interval of 50 feet. In connection with the above, for the vertical control, 137 miles of levels were run and 15 permanent bench marks were established.

ALASKA.

In the last annual report mention was made of the organization of four parties for service in Alaska, and an outline of the

plan of operations was presented. In the main, these plans were developed to a successful conclusion, the surveys contemplated having been executed without a serious accident of any kind, all the parties returning to Seattle within a few weeks of the time estimated.

In planning the operations to be undertaken, the requirements of the case seemed to make necessary two classes of work—first, surveys of exploration, to be extended into regions about which there was little or no satisfactory geographic information, and to be accompanied by geologic investigations of a reconnaissance character; and, second, detailed topographic surveys over areas whose general geographic features were fairly well known, but which were of such importance from a geologic and economic standpoint as to warrant a thorough examination.

The principal geographic results accomplished were the detailed survey of an area of about 2,000 square miles in the Klondike region, in the vicinity of Fortymile Creek; a traverse survey of portions of White River, Snag River, Mirror Creek, and Tanana River; a traverse of Sushitna River, with a topographic survey of considerable adjacent territory, including the measurement of the height of Mount McKinley, the altitude determined being about 20,500 feet, fixing it without doubt as the highest point on the North American continent; a traverse survey of a route extending along portions of the Yentna and Skwentna rivers, by the portage across the Tordrillo Range, along the Kuskokwim River to its mouth, along the Kanektok River, the Togiak River, and by inland water route by way of the Egoushik Lakes and River from Kulukak Bay to Nushagak Bay, and by way of Naknek Lake and River over the Aleutian Mountains to Katmai.

In addition, two members of the United States Geological Survey, Messrs. Schrader and Mendenhall, assistant geologists, accompanied the army expeditions under Captains Abercrombie and Glenn, and brought back considerable topographic information relating to the Copper and Matanuska rivers and the Kenai Peninsula.

The map of Fortymile district is being engraved as a standard atlas sheet of the Geological Survey, on a scale of

1:250000, or about 4 miles to the inch, with a contour interval of 100 feet. The route surveys will be published on a scale of 1:625000, or about 10 miles to the inch, with a sketch contour interval of approximately 100 feet.

Seattle was the rendezvous for the various members of the Geological Survey expedition, and Mr. George H. Eldridge, geologist, was in charge of the outfitting, remaining in general charge until the various parties were detached. There was great pressure brought to bear for positions from volunteers and others, but only those who were thoroughly trained and who could pass a rigid physical examination were selected. The qualities considered the most important were experience in packing loads on the back and familiarity with boats and with general habits of rough camp life. These men were known as camp hands, and were selected principally from the guides of the Adirondacks, from woodmen of the timber regions of Wisconsin, and from those accustomed to the forests and rivers of the Pacific coast. The men employed had in nearly every instance been previously engaged on the work of the Geological Survey in the regions above referred to.

With reference to the general outfitting, twelve Peterboro canoes, in nests of three, averaging about 140 pounds each, with canvas covers, were ordered. These canoes were of cedar, and were sufficiently rigid and light to meet the requirements of navigation in rough water and to be transported across country. Sleeping bags, made of woolen blankets with waterproof canvas covers, were furnished. They weighed about 12 pounds each. These bags are considered preferable to separate blankets, but care must be exercised in order to keep them dry and well aired. Pack bags for the men and sleighs for ice traveling were also supplied. Parties going to Alaska, owing doubtless to the persuasive influence of merchants at various outfitting points, are likely to overload themselves with a large amount of useless material—furs, rubbers, etc. Experience has demonstrated that one needs not much more in summer than would usually be taken on similar expeditions in the northwestern portion of the United States. Mosquito-proof tents are, however, a necessity. They are preferably made of very light

duck, the floor being sewed to the sides. No other tent would answer the purpose of keeping away these pests. When an ordinary tent is pitched on tundra it is impossible to keep them out, as they burrow under in great numbers and soon fill tents that are not provided with tight floors.

The provisions were generally packed in sacks containing a week's supply, so that bulk need not be broken except when articles were in use. In all about 22,000 pounds of provisions, camp equipment, etc., were gotten together in Seattle for the expedition.

The U. S. S. *Wheeling* had been placed at the disposal of the Geological Survey for the transportation of the parties with their outfit northward. The vessel left Seattle on April 5, with all on board except Mr. E. C. Barnard, topographer, who preceded the party. Permission had been obtained to utilize the reindeer which had been brought to this country from Europe through the efforts of Rev. Dr. Sheldon Jackson for use in Alaska, and the purpose of Mr. Barnard's going in advance was to investigate the practicability of using these reindeer in transporting his outfit to the Upper Yukon. They were found to be totally unfit for this purpose, as they were in a very feeble condition.

The *Wheeling* reached Skagway on April 11, and the parties under Messrs. Barnard and W. J. Peters were landed, the former being assigned to the survey of the area in the Klondike region, and the latter to the survey and examination of White and Tanana rivers. These parties were to cross the passes and descend the Yukon to the mouth of the White together, Mr. Barnard being in general charge until Mr. Peters commenced independent work. The *Wheeling* then proceeded to Cook Inlet with the Eldridge and Spurr parties.

There were about 13,000 pounds of material belonging to the Barnard and Peters parties to be transported, and this was carried by contract at the rate of 10½ cents per pound from Skagway to the head of Lake Bennett. The loads were taken in almost every conceivable manner—first, by wagon as far as was practicable, then by sleighs drawn by horses across White Pass, and finally by pack horses, pack men, and dog teams.

All the material was delivered at the head of Lake Bennett on April 22, and from this point to the lower end of Tagish Lake another contract was made at 9 cents per pound for transportation by means of horse sleighs. The six sleighs brought from Seattle, belonging to the Geological Survey, were also brought into requisition here. These sleighs carried a load of about 350 pounds, and were drawn by hand or propelled by the wind when favorable. Open water was encountered in Sixmile River, between Tagish Lake and Marsh Lake, and the six canoes were here used for the first time. Marsh Lake was reached on April 28, and the parties went into camp to await the breaking up of the ice, as it was no longer sufficiently strong to admit of safe passage by means of sleighs. A delay of a month resulted here, during which time an easy route was found and the journey was made to Teslin (or Hootalinqua) River, down which it was reported that parties had already proceeded to the Yukon. A trail to Lake Atlin was also surveyed, as well as a portion of the lake. Surveys were also made of Lake Bennett, and of Tagish and Marsh lakes, and a stadia line was run from the head of Lake Bennett to Crater Lake, which is just below the summit of Chilkoot Pass. The temperature at this camp ranged from 28° F. in the morning to about 57° at noon. Mosquitoes were plentiful and troublesome.

On May 28 the journey was continued in the boats, the only interruption encountered being at Miles Canyon and White Horse Rapids, where the outfit, with the exception of a large boat which had been built at Marsh Lake, was transported on a tramway. The large boat was sent through successfully under the direction of a pilot. The mouth of the White River was reached June 5, where the Peters party stopped to make preparations for its ascent. Mr. Barnard continued on with his outfit of six men and arrived at his destination at Fortymile Creek two days later.

The area to be surveyed by Mr. Barnard's party was the Fortymile quadrangle, immediately west of the international boundary, lying between latitudes 64° and 65°, and comprising 2,069 square miles. A base already existed in this locality,

the results of the astronomic and triangulation work executed by the United States Coast and Geodetic Survey in connection with the establishment of the one hundred and forty-first meridian—the international boundary. Thus it was possible to commence plane-table work with three or four points well located, all, however, being outside of the limits of the quadrangle and in Canadian territory. An uncertainty existed as to the exact elevation above sea level of any point in the vicinity which could be used as a vertical basis for the contours; but an estimate had been made by the United States Coast and Geodetic Survey officials, which gave an approximate elevation of 575 feet above sea level for the point of the transit house at Camp Davidson, on the Yukon, at the international boundary. The only other alternative to accepting this elevation was to attempt to determine an initial elevation by means of synchronous readings on cistern barometers at sea level and in the locality under survey; but this did not seem to be practicable on account of the decided barometric gradients existing between the ocean and the interior valleys of Alaska.

The party completed its work on September 15, proceeded down the Yukon in a river steamer, arrived at St. Michael on September 25, and at Seattle on October 5.

Survey of Sushitna River.

The party engaged in the survey of the Sushitna River was under the direction of Mr. G. H. Eldridge, geologist, and was accompanied by Mr. Robert Muldrow, topographer. In addition there were five camp hands. This party landed from the U. S. S. *Wheeling*, at Tyonek, on April 27. The route traveled, with dates, is indicated below:

May 4 to 8, from Tyonek to mouth of Sushitna River, along west shore of Cook Inlet, a distance of 35 miles.

May 20 to 25, from mouth of Sushitna River to mouth of Yentna River, a distance of 21 miles.

May 25 to June 27, from mouth of Yentna River to forks of Sushitna River, a distance of 61 miles.

June 27 to July 25, from forks of Sushitna to mouth of Indian Creek, a distance of 37 miles.

July 25 to August 17, from mouth of Indian Creek to head of Indian Creek, a distance of 20 miles.

August 17 to August 20, from head of Indian Creek to head of Chulitna River, a distance of 27 miles.

August 20 to August 28, from head of Chulitna to point on a tributary of Tanana, a distance of 62 miles.

August 28 to September 2, traveling back to mouth of Indian Creek.

September 2 to September 9, from mouth of Indian Creek to Tyonek.

September 25 to October 1, from Tyonek to Juneau, by steamer *Dora*.

October 1 to October 9, from Juneau to Seattle, by steamer *Alki*.

From Tyonek to the mouth of Indian Creek transportation was had by means of small boats, and from the mouth of Indian Creek across the country to the end of the trip by packing on foot, a distance of 109 miles, double trips being made over the first 20 miles.

A stadia line was run from Tyonek to the mouth of Indian Creek—154 miles—elevations being determined by vertical angles and directions by compass readings with transit. A plane-table sketch was also carried along, and latitudes were determined at intervals of 25 miles. From the mouth of Indian Creek to the head of Indian Creek there was a plane-table survey, and from the head of Indian Creek to the end of the trip a prismatic compass line was run with estimated distances.

From the above it appears that a linear survey of 263 miles was made.

Survey of Yentna, Skwentna, Kuskokwim, Kanektok, Togiak, Egoushtik, and Naknek rivers and Naknek Lake to Katmai.

The party detailed for the survey above mentioned was under the direction of Mr. J. E. Spurr, geologist, with Mr. W. S. Post as topographer. The force of the party varied from seven to four men. The itinerary was identical with that of the Eldridge party until the mouth of the Yentna River was reached. Afterwards the routes traveled, with corresponding dates, were as follows:

May 25 to June 1, from mouth of Yentna to mouth of Skwentna River, a distance of 43 miles.

June 1 to July 4, from mouth of Skwentna to beginning of portage, a distance of 65 miles.

July 4 to July 23, portage and canoes from Cook Inlet drainage to Kuskokwim drainage, across Tordrillo Range, 4,400 feet above sea level, a distance of 25 miles.

July 23 to July 29, down Kuskokwim River to East Fork of Kuskokwim, a distance of 107 miles.

Continuing down Kuskokwim River, Bethel Mission, at the mouth of Kuskokwim, was reached August 10, a distance of 491 miles from the mouth of the East Fork.

August 19 to August 25, along coast of Bering Sea to Kwinhagamut, a distance of 93 miles.
August 26 to September 10, Kwinhagamut to head of Kanektok River, a distance of 102 miles.
September 11 to September 17, from Kanektok River to Togiak Lake, a distance of 20 miles.
September 18 to 19, from Togiak Lake to Togiak trading station on Togiak Bay, a distance of 65 miles.
September 20 to 27, from Togiak to Nushagak trading station, by way of the Egou-shik River, a distance of 156 miles.
September 28 to October 10, Nushagak to Naknek, a distance of 79 miles.
October 10 to 13, Naknek to Savonoski, by way of Naknek River and Lake, a distance of 74 miles.
October 14 to 17, Savonoski to Katmai, a distance of 52 miles.

At Katmai the survey was discontinued.

On October 31 passage was taken on the steamer *Dora* for Seattle, which was reached November 15.

The total distance traversed was 1,372 miles, which included about 100 miles of portage, the remaining distance traveled being chiefly by canoe.

The topographic survey was carried forward at first by stadia, and afterwards by plane-table sketching, in connection with which distances were obtained at various times by stadia, pacing, resection, and estimation, and, in descending streams, by timing the current and paddling, the whole being governed by latitude checks. Observations for latitude, as well as for time and azimuth, were taken nearly every day.

In addition to the work above described, part of the expedition crossed from the Kuskokwim near Bethel Mission to the Yukon, and Mr. Hinckley, who was in charge, made a rough survey of this route, the first in existence.

Survey of White and Tanana Rivers.

The party detailed for the above-mentioned survey was under the direction of Mr. W. J. Peters, topographer, and was accompanied by Mr. Alfred H. Brooks, assistant geologist. In addition there were four camp hands. The routes traveled, with dates, were as follows:

June 8, commenced ascent of White River from its junction with Yukon.
July 10, reached Snag River, 85 miles from mouth of White River.
July 19, reached point on Snag River 66 miles from its mouth.
July 23, commenced portage of 3 miles between Snag River and Mirror Creek.
July 27, started down Mirror Creek, and August 3 reached the Tanana River, a distance of 60 miles.

August 5, started down Tanana River, and September 1 reached Weare, at junction of Tanana and Yukon rivers, a distance of 560 miles. Here the surveys stopped.

September 5, left Weare.

September 10, reached St. Michael.

September 25, left St. Michael.

October 6, arrived at Seattle, Washington.

Transportation was had by canoes and packing from the Yukon River at the mouth of the White to the Yukon River at the mouth of the Tanana. The remaining portion of the journey to Seattle was made by river and ocean steamer.

The methods of survey were as follows: A plane-table traverse from mouth of White River to the intersection of Mantasta trail with Tanana River, distances being obtained by triangulation from several short bases; a stadia line from Mantasta trail to foot of Bates Rapids; a traverse, depending on the estimate of current of Tanana River for distances and for direction on prismatic compass bearings, from the foot of Bates Rapids to the mouth of Tanana River. The total survey as above was 774 miles. Observations for latitude were obtained whenever weather and other circumstances permitted, the total number being 12.

Further details relating to work in Alaska may be found in a special advance publication—Maps and Descriptions of Routes of Exploration in Alaska in 1898—a report prepared in accordance with Public Resolution No. 25 of the Fifty-fifth Congress, third session. The complete report, with technical details and discussion, will appear as Part VII of this Annual Report.

OFFICE WORK.

The office work of the Topographic Branch consisted, as heretofore, in the computation of field observations by the triangulation division, and the preparation of the final drawings of topographic maps, the adjustment of the results of spirit leveling, the tabulation of bench marks, and the writing of the notes relating to public-land surveys, including the drawing of the necessary plats, by the topographic division.

The table herewith shows the atlas sheets, numbering 65, which were completed and submitted for engraving during the year.

• Topographic sheets completed in office during 1898-99.

State and sheet.	Scale.	Contour interval.
Alabama:		<i>Feet.</i>
Anniston (resurvey)	1:125000	50
Fort Payne (resurvey)	1:125000	50
Arkansas:		
Winslow	1:125000	50
California:		
San Luis Rey	1:125000	100
San Jacinto	1:125000	100
Elsinore	1:125000	100
Colorado:		
Engineer Mountain	1:62500	100
Rico Special (resurvey)	1:23600	50
Indian Territory:		
Addington	1:125000	50
Ardmore	1:125000	50
Atoka	1:125000	50
Eagletown	1:125000	50
Muscogee	1:125000	50
Rush Springs	1:125000	50
Seven Devils	1:125000	50
Stonewall	1:125000	50
Tahlequah	1:125000	50
Tishomingo	1:125000	50
Turkey Trail	1:125000	50
Tuskahoma	1:125000	50
Winding Stairs	1:125000	50
Indian Territory-Texas:		
Denison	1:125000	50
Iowa:		
Iowa City (revision)	1:125000	20
Tipton (revision)	1:125000	20
Davenport (revision)	1:125000	20
Iowa-Wisconsin:		
Elkader	1:125000	20
Kansas:		
Lakin	1:125000	20
Syracuse	1:125000	20
Maryland:		
Flintstone	1:62500	20
Grantsville	1:62500	20
Accident	1:62500	20
Pawpaw	1:62500	20

Topographic sheets completed in office during 1898-99—Continued.

State and sheet.	Scale.	Contour interval.
Michigan:		<i>Feet.</i>
Iron Mountain.....	1:62500	20
Minnesota:		
Vermilion Iron Range (4 sheets).....	1:62500	20
Missouri:		
Bonne Terre (revision)	1:125000	50
Missouri-Illinois:		
O'Fallon	1:125000	50
Montana:		
Helena Special (resurvey)	1:62500	50
Montana-Idaho:		
Hamilton	1:125000	100
Nebraska:		
Paxton	1:125000	20
New York:		
Schoharie.....	1:62500	20
Canajoharie.....	1:62500	20
Little Falls	1:62500	20
Wilmurt.....	1:62500	20
Schuylerville	1:62500	20
Baldwinsville	1:62500	20
Fulton.....	1:62500	20
Oswego	1:62500	20
Macedon.....	1:62500	20
Watkins	1:62500	20
Dryden	1:62500	20
Silver Creek	1:62500	20
Westfield	1:62500	20
Dunkirk	1:62500	20
Cherry Creek	1:62500	20
Canada Lakes	1:62500	20
Ohio:		
Ironton	1:62500	20
Ohio-Kentucky:		
East Cincinnati	1:62500	20
West Cincinnati.....	1:62500	20
Oregon:		
Port Orford	1:125000	100
South Dakota:		
Spearfish (resurvey).....	1:62500	50
South Dakota-Nebraska:		
Elk Point.....	1:125000	20

Topographic sheets completed in office during 1898-99—Continued.

State and sheet.	Scale.	Contour interval.
Washington:		<i>Feet.</i>
Spokane	1:125000	100
Waterville	1:125000	100
Snoqualmie	1:125000	100
Wyoming:		
Bald Mountain	1:125000	100

Mr. S. S. Gannett, as heretofore, had charge of all office computation. The results of this work are summarized and published in the Appendix, as is also a list of the permanent bench marks established by spirit leveling.

Mr. S. A. Aplin, custodian of instruments, was placed in charge of the purchase and repair of instruments, thus relieving Mr. Douglas of that work. The repair work for the year was done by private instrument makers at hour labor, Mr. G. N. Saegmüller, of Washington, D. C., and Messrs. W. & L. E. Gurley, of New York, being the principal contractors. The instruments have been generally overhauled, particularly the telescopic alidades, to which some improvements in the telescopes have been made, to make them conform to the methods now in use. Two transits, two telescopic alidades of special design, and two stenometers—instruments of special design for measuring small angles micrometrically—were constructed for the use of parties sent to Alaska.

Mr. Aplin was also in charge of the topographic records during the year, and was assisted by Mr. Joseph W. Kreuttner in the continuation of the cataloguing and systematic arrangements of these records. During the year about 500 notebooks, including triangulation, topographic, and level records, and 250 miscellaneous maps and plane-table sheets, representing the results of the previous season's work, were cross-indexed and filed. The arrangement of the envelopes containing miscellaneous matter pertaining to each atlas sheet was continued, but has not yet been completed. There are on hand about 1,000 notebooks, sketch sheets, and miscellaneous maps, recently turned in, which remain to be catalogued and filed.

Miss Mary H. Corbett, Miss Mary Mitchell, and Miss Helen Fields performed the necessary stenographic and typewriting work.

GEOGRAPHY AND FORESTRY.

GEOGRAPHY.

Mr. Henry Gannett, geographer of the Survey, continued in charge of the revision of the large map of the United States, and also gave consideration to such geographic matters as were referred to him.

The third edition of the Dictionary of Altitudes, which had been commenced at the date of the last annual report, was completed and read in proof, and will shortly be issued as Bulletin No. 160—a volume of nearly 800 pages.

A second physiographic folio, embracing ten sheets, representing as many types of topography, was prepared, and is now in process of publication.

A physiographic folio relating to the State of Texas, prepared by Mr. Robert T. Hill, is now in process of publication.

A Gazetteer of Utah has been commenced and is well advanced toward completion.

FORESTRY.

The forestry work is divisible into the examination of forest reserves, the collection of statistics of standing timber, and the classification of lands.

The Flathead Reserve, Montana, was examined by Mr. H. B. Ayres, and a report upon it was prepared.

The Idaho portion of the Bitterroot Reserve was examined by Mr. Leiberg, and a report was made upon the whole of this large and important reserve, the Montana portion having been examined by Mr. Leiberg during the previous year.

Work was commenced in the Mount Rainier Reserve of Washington by Messrs. F. G. Plummer and John Russell, and about 1,500 square miles were completed, including most of the northern portion of the area. As this reserve contains a large amount of valuable timber, it has been considered desirable to have the examination made in greater detail than in the

more lightly timbered reserves in the Rocky Mountain country. A preliminary report upon the area examined was made.

Work was commenced by Mr. Theodore Rixon and Mr. Arthur Dodwell in the Olympic Reserve of Washington, and some 500 square miles were examined in the southeastern part of that reserve. This, like the Mount Rainier Reserve, contains dense and valuable forests, warranting a thorough examination. A preliminary report upon this work was prepared.

The Pikes Peak, Plum Creek, and South Platte reserves of Colorado were examined by Mr. John G. Jack, and reports were submitted by him upon these areas.

The White River and Battlement Mesa reserves, in western Colorado, were examined by Mr. George B. Sudworth, and reports upon them were submitted.

During the last winter Mr. Fred. G. Plummer was engaged in the collection of data for the classification of lands in western Washington, and of statistics of standing timber on cut and burned areas. This work was completed, and in Part V of this report, relating to forestry, there is presented a complete classification of the lands of the State, together with a close and somewhat detailed estimate of the standing timber, under the Washington lumbering practice.

During the last winter Mr. A. J. Johnson was employed for the collection of similar data regarding the lands and timber of Oregon, and made good progress in this work, although it is by no means completed.

Since the completion of his report upon the Flathead Reserve, Mr. H. B. Ayres has been employed, in cooperation with the Division of Forestry of the Department of Agriculture, in the collection of data of land classification and the stand of timber in the States of Minnesota, Wisconsin, and Michigan. The work has made good progress, although it is not yet completed.

The preparation of land-classification sheets was commenced. Those of the Seattle and Tacoma quadrangles are now in process of publication, and those of the Spokane and Mount Stuart quadrangles, of Washington, and of the Roseburg and Coos Bay quadrangles, of Oregon, have been completed and are ready for the engraver. Besides these, the forestry portions

of numerous other sheets were completed, and these sheets await only the addition of data concerning arable and pasture lands.

PUBLICATION BRANCH.

DIVISION OF ILLUSTRATIONS.

Upon the resignation of Mr. De Lancey W. Gill, July 16, the Division of Illustrations was placed in charge of Mr. John L. Ridgway, who was assisted throughout the year by Messrs. H. Chadwick Hunter, H. Hobart Nichols, D. W. Cronin, F. W. von Dachenhausen, J. H. Pellen, and George T. Sabourin, clerk, and, for a part of the year, by Mr. Williams Welch. Dr. J. C. McConnell, Miss Frances Wieser, Mr. A. H. Baldwin, and Mrs. Mary M. Leighter were employed temporarily at different times.

Drawings to be used as illustrations for Parts I to VI of the Nineteenth Annual Report, 8 monographs, 4 bulletins, 11 water-supply papers, and 2 folios, were transmitted to the Public Printer. These drawings numbered 3,017, as follows: Geologic landscapes, 46; diagrams and sections, 438; paleontologic drawings, 1,193; maps prepared for reproduction, 167; photographs prepared for reproduction, 646; miscellaneous drawings, 527. The processes selected for the reproduction of the above illustrations, with the total number reproduced by each, were as follows: Lithography, 18; photolithography, 4; chromolithography, 206; photogelatin, 64; half-tone, 845; photoengraving, 792.

Proofs to the number of 1,965 were received in the division during the year. All illustrations by the lithographic and photogelatin processes were examined after they were delivered at the Government Printing Office.

PHOTOGRAPHIC LABORATORY.

The photographic work was, as in previous years, in charge of Mr. J. K. Hillers, who was assisted by Messrs. C. C. Jones, John Erbach, Charles A. Ross, Nelson H. Kent, and Edgar M. Bane. A number of improvements were made in the laboratory during the year. The facilities for printing were

enlarged, a new dark room was constructed, two new cameras were added, and the general efficiency of the force employed as well as the quality of the work was improved.

Following is a tabular statement of the work done in the laboratory during the year :

Photographic negatives, prints, slides, etc., made during 1898-99.

Month.	Negatives made.			Prints.	Slides.	Prints mounted.
	Wet.	Dry.	Total.			
1898.						
July	123	72	195	375	-----	142
August	39	255	294	727	-----	2
September	163	628	791	877	16	-----
October	88	564	652	1, 243	18	2
November	29	985	1, 014	2, 120	30	3
December	123	664	787	2, 134	176	216
1889.						
January	80	476	556	1, 518	33	18
February	62	736	798	775	109	49
March	132	144	276	3, 606	179	-----
April	166	106	274	1, 552	2	38
May	101	72	173	1, 531	-----	25
June	64	31	95	1, 771	-----	-----
Total	1, 170	4, 735	5, 905	18, 229	563	495

Sizes of negatives and prints made during 1898-99.

Size.	Negatives.	Prints.
28 by 34 inches	157	641
22 by 28 inches	70	321
20 by 24 inches	233	1,461
14 by 17 inches	111	481
11 by 14 inches	206	822
8 by 10 inches	231	582
6 by 8 inches	171	928
5 by 7 inches	1,551	5,058
4 by 5 inches	3,126	7,934
Total	5,856	18,228

EDITORIAL DIVISION.

TEXTUAL PUBLICATIONS.

Mr. Philip C. Warman remained in charge of this section. He was assisted throughout the year by Mr. George M. Wood, and by Mr. Frank R. Rutter until May 25, when, on request of the Secretary of Agriculture, Dr. Rutter was transferred to that Department. Late in the year Miss M. G. Wilmarth and Mr. L. F. Schmeckebier were assigned to the editorial work.

As during previous years the work progressed in a highly satisfactory manner, and at the close of the fiscal year was well in hand. Following are lists of the manuscripts prepared for the printer and of the proofs read and corrected during the year:

Manuscripts edited during the year 1898-99.

Publication.	Pages (usually type-written).
Nineteenth Annual Report (in part).....	4, 782
Twentieth Annual Report (in part)	1, 063
Monograph XXXIII	1, 419
Monograph XXXVI	763
Monograph XXXVII.....	848
Monograph XXXVIII.....	1, 169
Bulletin No. 156	289
Bulletin No. 157	265
Bulletin No. 158	250
Bulletin No. 159	240
Bulletin No. 160	1, 791
Bulletin No. 161	94
Water-Supply Paper No. 17	193
Water-Supply Paper No. 18	182
Water-Supply Paper No. 19	130
Water-Supply Paper No. 20	185
Water-Supply Paper No. 21	169
Water-Supply Paper No. 22	252
Water-Supply Paper No. 23	89
Water-Supply Paper No. 24	170
Water-Supply Paper No. 25	166
Water-Supply Paper No. 26	165
Water-Supply Paper No. 27	243
Water-Supply Paper No. 28	208

Manuscripts edited during the year 1898-99—Continued.

Publication.	Pages (usually type-written.)
Water-Supply Paper No. 29	171
Water-Supply Paper No. 30	165
Geologic folio No. 44	22
Geologic folio No. 45	81
Geologic folio No. 46	42
Geologic folio No. 47	32
Geologic folio No. 48	62
Geologic folio No. 49	47
Geologic folio No. 50	100
Geologic folio No. 51	60
Geologic folio No. 52	59
Geologic folio No. 53	44
Physiographic folio No. 2	40
Alaska report (Public Resolution No. 25, 55th Congress, 3d session) .	227
Senate Document No. 116, 55th Congress, 3d session	46
Total number of manuscript pages edited	16,323

Proof sheets read and corrected during the year 1898-99.

Publication.	Final printed pages.
Nineteenth Annual Report (in part)	4,438
Twentieth Annual Report (in part)	261
Monograph XXXI	293
Monograph XXXII, Part II	910
Monograph XXXIII	422
Monograph XXXIV	512
Monograph XXXV	312
Monograph XXXVI	547
Monograph XXXVII	478
Monograph XXXVIII	838
Bulletin No. 156	130
Bulletin No. 160	775
Bulletin No. 161	31
Water-Supply Paper No. 17	96
Water-Supply Paper No. 18	94
Water-Supply Paper No. 19	59
Water-Supply Paper No. 20	97

Proof sheets read and corrected during the year 1898-99—Continued.

Publication.	Final printed pages.
Water-Supply Paper No. 21.....	82
Water-Supply Paper No. 22.....	100
Water-Supply Paper No. 23.....	62
Water-Supply Paper No. 24.....	99
Water-Supply Paper No. 25.....	100
Water-Supply Paper No. 26.....	64
Water-Supply Paper No. 27.....	100
Water-Supply Paper No. 28.....	100
Water-Supply Paper No. 29.....	85
Geologic folio No. 44.....	6
Geologic folio No. 45.....	7
Geologic folio No. 46.....	4
Geologic folio No. 47.....	4
Geologic folio No. 48.....	6
Geologic folio No. 49.....	4
Geologic folio No. 50.....	8
Geologic folio No. 51.....	6
Alaska report (Public Resolution No. 25, 55th Congress, 3d session)	138
Senate Document No. 116, 55th Congress, 3d session	46
Total number of printed pages.....	11,316

The publications in the last table number 34. Some are small, some large; their average is 319 pages.

The Survey publications are carefully indexed, usually by the editorial corps, and this branch of the work requires much time and labor. Occasionally an author furnishes a satisfactory index, but such instances are rare. An index, even to a large volume, is so unpretentious and inconspicuous that the labor necessary to its preparation is seldom realized or appreciated. Neither the disappointment of a reader whose time and patience have been spent with a poor index, nor the gratitude of one whose researches have been facilitated by a good index, is likely to find expression. It is believed that the indexes to the Survey publications are, as a rule, good. The credit for their excellence is due, Mr. Warman reports, largely to his associate, Mr. Wood, who has made most of them, and who has for many years faithfully cooperated in all branches

of the work. The following table shows that there have been indexed during the year 7,627 printed pages:

Indexes prepared during the year 1898-99.

Publication.	Pages indexed.
Nineteenth Annual Report, Part I	408
Nineteenth Annual Report, Part II	946
Nineteenth Annual Report, Part III	767
Nineteenth Annual Report, Part IV	785
Nineteenth Annual Report, Part V	387
Monograph XXXI	256
Monograph XXXII, Part II	882
Monograph XXXIII	394
Monograph XXXIV	489
Monograph XXXVII	456
Monograph XXXVIII	797
Bulletin No. 161	29
Water-Supply Paper No. 17	94
Water-Supply Paper No. 18	91
Water-Supply Paper No. 19	58
Water-Supply Paper No. 20	96
Water-Supply Paper No. 21	79
Water-Supply Paper No. 22	98
Water-Supply Paper No. 23	60
Water-Supply Papers Nos. 24-25 (joint index)	198
Water-Supply Paper No. 26	61
Water-Supply Papers Nos. 27-28 (joint index)	196
Total number of pages indexed	7,627

The work of this section of the Editorial Division necessarily accords closely with the literary output of the Survey. Both have increased greatly during the last five years. The increase of work during this period, and the increase of the total for the last five years as compared with the total for the five preceding years, are shown in the table following, which has been compiled from the annual reports of the editor.

Manuscript edited and proof read each year since 1889-90.

	Manuscript edited.	Proof read.
	<i>Pages.</i>	<i>Pages.</i>
Fiscal year 1889-90	8,612	4,592
Fiscal year 1890-91	7,198	6,011
Fiscal year 1891-92	11,079	3,897
Fiscal year 1892-93	10,172	4,547
Fiscal year 1893-94	9,830	3,748
Total for period 1890-94	46,891	22,795
Fiscal year 1894-95	7,988	4,652
Fiscal year 1895-96	12,875	4,627
Fiscal year 1896-97	13,361	7,446
Fiscal year 1897-98	15,276	8,350
Fiscal year 1898-99	16,323	11,316
Total for period 1895-99	65,823	36,391

Mr. Warman has commenced the preparation of a new edition of Bulletin No. 100. This, when completed, will be a catalogue and general (not detailed) index of all of the publications of the Geological Survey from its organization in 1879 to the year 1900.

GEOLOGIC MAPS.

Mr. George W. Stose continued in charge of this section during the year. In this capacity he critically examined the manuscript maps, geologic sections, and illustrations submitted by geologists for publication as folios, and conferred with the authors in the preparation of the same for the engraver. He also assisted by reading a few folio texts and proofs, had supervision of all proof reading of maps, and selected the colors and patterns used on the various sheets. Most of the proof reading was done by Messrs. O. A. Ljungstedt and H. S. Selden. Mr. Selden was also occupied in making diagrams, maps, and other drawings for the office, and Mr. Ljungstedt was chiefly engaged in drawing structure and columnar sections for the folios, for which work he has become specially qualified by his studies and skill in detailed drafting.

The descriptive texts were edited geologically by Mr. Bailey Willis, and for construction and expression by Mr. P. C. Warman.

During the year nine folios were transmitted by the authors and were accepted for publication, as follows: Colfax, California; Charleston, West Virginia; Huntington, West Virginia-Ohio-Kentucky; Mother Lode District, California; Spanish Peaks, Colorado; Tintic, Utah; Uvalde, Texas; Washington, District of Columbia; Walsenburg, Colorado. There were completed and issued eight folios, numbers 44 to 51, inclusive. Following is a complete list of all the published folios:

Geologic folios published.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
1	Livingston	Montana.....	110°-111°	45°-46°	3,354	25
2	Ringgold	Georgia.....	85°-85° 30'	34° 30'-35°	980	25
		Tennessee.....				
3	Placerville.....	California	120° 30'-121°	38° 30'-39°	932	25
4	Kingston	Tennessee	84° 30'-85°	35° 30'-36°	969	25
5	Sacramento.....	California	121°-121° 30'	38° 30'-39°	932	25
6	Chattanooga...	Tennessee	85°-85° 30'	35°-35° 30'	975	25
7	Pikes Peak (including Cripple Creek).	Colorado.....	105°-105° 30'	38° 30'-39°	932	25
8	Sewanee	Tennessee	85° 30'-86°	35°-35° 30'	975	25
9	Anthracite-Crested Butte.	Colorado.....	106° 45'-107° 15'	38° 45'-39°	465	50
10	Harpers Ferry ..	Virginia.....	77° 30'-78°	39°-39° 30'	925	25
		West Virginia.....				
11	Jackson	Maryland.....	120° 30'-121°	38°-38° 30'	938	25
		California				
12	Estillville	Virginia.....	82° 30'-83°	36° 30'-37°	957	25
		Kentucky				
13	Fredericksburg	Tennessee	77°-77° 30'	38°-38° 30'	938	25
		Maryland.....				
14	Staunton	Virginia.....	79°-79° 30'	38°-38° 30'	938	25
		West Virginia.....				
15	Lassen Peak...	California	121°-122°	40°-41°	3,634	25
16	Knoxville	Tennessee	83° 30'-84°	35° 30'-36°	969	25
		North Carolina				
17	Marysville.....	California	121° 30'-122°	39°-39° 30'	925	25
18	Smartsville	California	121°-121° 30'	39°-39° 30'	925	25
19	Stevenson	Alabama.....	85° 30'-86°	34° 30'-35°	980	25
		Georgia.....				
20	Cleveland.....	Tennessee	84° 30'-85°	35°-35° 30'	975	25
21	Pikeville	Tennessee	85°-85° 30'	35° 30'-36°	969	25
22	McMinnville ..	Tennessee	85° 30'-86°	35° 30'-36°	966	25
23	Nomini	Maryland.....	76° 30'-77°	38°-38° 30'	938	25
		Virginia.....				
24	Three Forks...	Montana.....	111°-112°	45°-46°	3,354	50

Geologic folios published—Continued.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in Price square. in miles. cents.	
25	London	Tennessee	84°-84° 30'	35° 30'-36°	969	25
26	Pocahontas	Virginia	81°-81° 30'	37°-37° 30'	950	25
27	Morristown	West Virginia	83°-83° 30'	36°-36° 30'	963	25
28	Piedmont	Tennessee	79°-79° 30'	39°-39° 30'	925	25
		Virginia				
		Maryland				
		West Virginia				
29	Nevada City					
	Special:					
	Nevada City		121° 00' 25"-121° 03' 45"	39° 13' 50"-39° 17' 16"	11.65	50
	Grass Valley	California	121° 01' 35"-121° 05' 04"	39° 10' 22"-39° 13' 50"	12.09	
	Banner Hill		120° 57' 05"-121° 00' 25"	39° 18' 50"-39° 17' 16"	11.65	
30	Yellowstone					
	National					
	Park:					
	Gallatin ...					
	Canyon	Wyoming	110°-111°	44°-45°	3,412	75
	Shoshone ...					
	Lake					
31	Pyramid Peak	California	120°-120° 30'	38° 30'-39°	932	25
32	Franklin	Virginia	79°-79° 30'	38° 30'-39°	932	25
		West Virginia				
33	Briceville	Tennessee	84°-84° 30'	36°-36° 30'	963	25
34	Buckhannon ...	West Virginia	80°-80° 30'	38° 30'-39°	932	25
35	Gadsden	Alabama	86°-86° 30'	34°-34° 30'	986	25
36	Pueblo	Colorado	104° 30'-105°	38°-38° 30'	938	50
37	Downieville ...	California	120° 30'-121°	39° 30'-40°	919	25
38	Butte Special ..	Montana	112° 29' 30"-112° 36' 42"	45° 59' 28"-46° 02' 54"	22.8	50
39	Truckee	California	120°-120° 30'	39°-39° 30'	925	25
40	Wartburg	Tennessee	84° 30'-85°	36°-36° 30'	963	25
41	Sonora	California	120°-120° 30'	37° 30'-38°	944	25
42	Nueces	Texas	100°-100° 30'	29° 30'-30°	1,085	25
43	Bidwell Bar ...	California	121°-121° 30'	39° 30'-40°	910	25
44	Tazewell	Virginia	81°30'-82°	37°-37°30'	950	25
		West Virginia				
45	Boise	Idaho	116°-116°30'	43°30'-44°	864	25
46	Richmond	Kentucky	84°-84° 0'	37°30'-38°	944	25
47	London	Kentucky	84°-84°30'	37°-37°30'	950	25
48	Tenmile Dis-	Colorado	106°08'-106°10'08"	39°22'57"-39°30'25"	62.2	25
	trict Special.					
49	Roseburg	Oregon	123°-123°30'	43°-43°30'	871	25
50	Holyoke	Massachusetts ..	72°30'-73°	42°-42°30'	885	50
51	Big Trees	California ...	120°-120°30'	38°-38°30'	938	25

In addition to these there are in hand, in process of engraving and printing, the following:

Geologic folios in process of engraving and printing.

Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Estimated price in cents.
Absaroka:					
Crandall	Wyoming.....	109°30'-110°	44°30'-45°	849	25
Ishawooa.....		109°30'-110°	44°-44°30'	857	
Bristol	West Virginia	82°-82°30'	36°30'-37°	957	25
Elmore.....	Colorado.....	104°-104°30'	37°-37°30'	950	25
Fort Benton.....	Montana.....	110°-111°	47°-48°	3,234	50
La Plata	Colorado.....	108°-108°15'	37°15'-37°30'	237	25
Little Belt Mountains.	Montana.....	110°-111°	46°-47°	3,295	50
Monterey	Virginia.....				
	West Virginia.....	79°30'-80°	38°-38°30'	938	25
	Ohio.....				
Standingstone.....	Tennessee.....	85°-85°30'	36°-36°30'	963	25
Tacoma	Washington.....	122°-122°30'	47°-47°30'	812	25
Telluride.....	Colorado.....	107°45'-108°	37°45'-38°	236	25

Of these the Absaroka, Fort Benton, Little Belt Mountains, Standingstone, Tacoma, and Telluride are well advanced and will probably be completed before the close of the year 1899.

Of the folios issued this year the Tazewell and Holyoke were extremely intricate and involved very delicate and accurate work on the part of the Division of Engraving and Printing. The minuteness of the geologic subdivisions was a severe test of exactness of registration and of the efficiency of pattern distinctions. The Holyoke has an additional geologic sheet for the surficial rocks, which is the first exclusively Pleistocene sheet to appear in the folios. The Tacoma sheet is also largely Pleistocene, and the harmonious effect of the colors and patterns of these two folios indicates that the provisional color scheme adopted for Pleistocene formations three years ago is quite satisfactory.

TOPOGRAPHIC MAPS.

The work throughout the year was under the direction of Mr. Marcus Baker, who was assisted by Messrs. James McCormick, H. W. Elmore, and William Stranahan. Mr. Baker continued, as last year, to give his time and energies to the

disputed Venezuela-British Guiana boundary, to work as secretary of the United States Board on Geographic Names, and to various duties of a miscellaneous nature. The actual editorial work was largely in the hands of Mr. McCormick, who was continuously employed upon it throughout the year, except during August and September, 1898, when he was engaged in field work in central New York.

New topographic atlas sheets were critically examined, amended if found necessary, and approved for engraving. The proofs submitted by the engraver were read and, after needful correction, approved for printing. Similarly as to old sheets of which editions were exhausted, needful corrections were furnished the engraver, the proofs read, and new editions issued.

The manuscript maps designed for illustrating the various publications in book form—reports, monographs, bulletins, etc.—were examined and revised as to their nomenclature. Circulars of information concerning the topographic maps, showing which have been made and how they may be obtained, were also revised and reissued from time to time.

Good progress was made in the preparation and publication of maps on a scale of 1:125000 by the reduction and combination of those originally published on a scale of 1:62500. The record of progress to date is as follows:

Combined maps on reduced scale.

Name of sheet; scale, 1:125000.	Name of sheet; scale, 1:62500, reduced and combined.	Stage of progress in publication.
Holyoke, Massachusetts-Connecticut.	Chesterfield, Granville, Northampton, Springfield.	Published previous to July, 1898.
Nomini, Maryland-Virginia.	Leonardtown, Montross, Piney Point, Wicomico.	Do.
Housatonic, Massachusetts-Connecticut-New York.	Becket, Pittsfield, Sandisfield, Sheffield.	Published during fiscal year 1898-99.
Niagara, New York	Lockport, Niagara Falls, Olcott, Tonawanda, Wilson.	Do.

Combined maps on reduced scale—Continued.

Name of sheet; scale, 1:125000.	Name of sheet; scale 1:625000, reduced and combined.	Stage of progress in publication.
Patuxent, Maryland-District of Columbia.	Brandywine, East Washington, Owensville, Prince Frederick.	Published during fiscal year 1898-99.
Raritan, New Jersey...	Hackettstown, High Bridge, Lake Hopatcong, Somerville.	In process of engraving.
Passaic, New Jersey-New York.	Morristown, Paterson, Plainfield, Staten Island.	Do.
San Luis, California...	Arroyo Grande, Cayucos, Port Harford, San Luis Obispo.	Approved for engraving.
Camden, New Jersey-Pennsylvania-Delaware.	Chester, Glassboro, Philadelphia, Salem.	Do.
Rancocas, New Jersey.	Hammonton, Mount Holly, Mullica, Pemberton.	Do.
Taconic, New York-Massachusetts-Vermont.	Bennington, Berlin, Greylock, Hoosick.	Do.

Each of these names, excepting Holyoke and Nomini, appears in the appropriate group below.

On July 1, 1898, there were on hand 84 unpublished atlas sheets. Of these some were in various stages of engraving, while work upon others was not yet begun. In addition to these, 80 new sheets were received during the year, making a total of 164. These 164 new sheets are listed below, in four groups:

Group I, containing 52 sheets, comprises those whose engraving was completed during the year and which were approved for printing.

Group II comprises 25 sheets which were in process of engraving at the close of the year.

Group III comprises 52 sheets which had been edited and approved for engraving.

Group IV comprises 35 sheets which, at the close of the year, had not yet been approved for engraving.

GROUP I.—*Topographic atlas sheets and other maps engraved and printed (or approved for printing) during the fiscal year 1898-99.*

Quadrangle and State.	Position of SE. corner.		Contour interval.	Scale.
	Latitude.	Longitude.		
	° /	° /	Feet.	
Auburn, New York	42 45	76 30	20	1:62500
Boulder, Montana	64 00	120 00	100	1:125000
Brockport, New York	43 00	77 45	20	1:62500
Charleston, West Virginia (a)	38 00	81 30	100	1:125000
Coalgate, Indian Territory	34 30	96 00	50	1:125000
Cottonwood Falls, Kansas	38 00	96 30	50	1:125000
Crystal Falls, Michigan	46 15	88 15	20	1:62500
Danville, Illinois-Indiana	40 00	87 30	10	1:62500
David City, Nebraska	41 00	97 00	20	1:125000
Deming, New Mexico	32 00	107 30	100	1:125000
De Smet, South Dakota	44 00	97 30	20	1:125000
Dunlap, Illinois (b)	40 45	89 30	10	1:62500
Elkton, Maryland-Delaware- Pennsylvania	39 30	75 45	20	1:62500
Ellendale, South Dakota-North Dakota	45 30	98 30	20	1:125000
Frostburg, Maryland-West Vir- ginia-Pennsylvania	39 30	78 45	20	1:62500
Goshen Hole, Wyoming-Nebraska.	41 30	104 00	20	1:125000
Hamlin, New York	43 15	77 45	20	1:62500
Haywards, California	37 30	122 00	25	1:62500
Hebron, Nebraska	40 00	97 30	20	1:125000
Hempstead, New York	40 30	73 30	20	1:62500
Housatonic, Massachusetts-Con- necticut-New York	42 00	73 00	40	1:125000
Huron, South Dakota	44 00	98 00	20	1:125000
Iron River, Michigan-Wisconsin ..	46 00	88 30	20	1:62500
McAlester, Indian Territory	34 30	95 30	50	1:125000
Moravia, New York	42 30	76 15	20	1:62500
Mother Lode District Claim map:				
Sheet I, California			100	1:63360
Sheet II, California			100	1:63360
Mount Stuart, Washington	47 00	120 30	100	1:125000
Nampa, Idaho, Oregon (b)	43 30	116 30	100	1:125000
Niagara, New York	43 00	78 30	20	1:125000
Northville, South Dakota	45 00	98 30	20	1:125000
Oceana, West Virginia-Virginia, Kentucky (a)	37 30	81 30	100	1:125000

(a) Resurvey.

(b) Redrawn.

GROUP I.—*Topographic atlas sheets and other maps engraved and printed (or approved for printing) during the fiscal year 1898-99—Continued.*

Quadrangle and State.	Position of SE. corner.		Contour interval.	Scale.
	Latitude.	Longitude.		
Oyster Bay, New York-Connecticut	40 45	73 30	20	1:62500
Patuxent, Maryland-District of Columbia	38 30	76 30	20	1:125000
Pisgah, North Carolina-South Carolina (a)	35 00	82 30	100	1:125000
Port Orford, Oregon	42 30	124 00	100	1:125000
Redfield, South Dakota	44 30	98 30	20	1:125000
Rome, Georgia-Alabama (a)	34 00	85 00	100	1:125000
Sagola, Michigan	46 00	88 00	20	1:62500
St. Mary, Maryland	38 00	76 00	20	1:125000
Salyersville, Kentucky (a)	37 30	83 00	100	1:125000
Skaneateles, New York	42 45	76 15	20	1:62500
Sturgis, South Dakota	45 15	103 30	50	1:62500
Sundance, Wyoming	44 00	104 00	50	1:125000
Superior, Nebraska	40 00	98 00	20	1:125000
Tintic Mining Map, Utah			20	1:9600
Tintic Special Sheet, Utah			50	1:62500
Tolchester, Maryland	39 00	76 00	20	1:125000
Wahoo, Nebraska	41 00	96 30	20	1:125000
Whistle Creek, Nebraska	42 00	103 30	20	1:125000
Witbeck, Michigan	46 15	88 00	20	1:62500
York, Nebraska	40 30	97 30	20	1:125000

a Resurvey.

GROUP II.—*Topographic atlas sheets and other maps in process of engraving.*

Alexandria, South Dakota.	Passaic, New Jersey-New York.
Atoka, Indian Territory.	Pawpaw, Maryland-West Virginia-Pennsylvania.
Brookwood, Alabama.	Raritan, New Jersey.
Browns Creek, Nebraska.	Rico Special Map, Colorado.
Clinton, Iowa-Illinois.	Saint Paul, Nebraska.
Dover, Maryland-Delaware-Pennsylvania.	Sallisaw, Indian Territory.
Flintstone, Maryland-West Virginia-Pennsylvania.	Sawtooth, Idaho.
Franklin Furnace Special Map, New Jersey.	Seattle Forestry Map, Washington.
Grantsville, Maryland-Pennsylvania.	Sidney, Nebraska.
Helena Special Map, Montana.	Tacoma Forestry Map, Washington.
Loup, Nebraska.	Texas, Topographic Map of.
Mitchell, South Dakota.	Vineland, New Jersey-Delaware.
	Winding Stair, Indian Territory.

GROUP III.—*Manuscript topographic atlas sheets examined and approved for engraving.*

Accident, Maryland-Pennsylvania-West Virginia.	Old Forge, New York.
Addington, Indian Territory.	Oswego, New York.
Antlers, Indian Territory.	Peterboro, New Hampshire.
Ardmore, Indian Territory.	Pingree, North Dakota.
Baldwinsville, New York.	Pryor, Indian Territory.
Camden, New Jersey-Pennsylvania-Delaware.	Rancocas, New Jersey.
Canada Lake, New York.	Remsen, New York.
Canadian, Indian Territory.	Riverside, California.
Canajoharie, New York.	Salamanca, New York.
Canton, South Dakota-Iowa.	San Luis, California.
Cazenovia, New York.	Sans Bois, Indian Territory.
Chappell, Nebraska.	Schoharie, New York.
Claremore, Indian Territory.	Schuylerville, New York.
Evanston, Illinois.	Stonewall, Indian Territory-Oklahoma.
Fernando, California.	Syracuse, Kansas.
Fulton, New York.	Taconic, New York-Massachusetts-Vermont.
Highwood, Illinois.	Tahlequah, Indian Territory.
Indian Lake, New York.	Tishomingo, Indian Territory.
Lakin, Kansas.	Toleston, Indiana.
Lancaster, Wisconsin-Iowa-Illinois.	Tujunga, California.
Little Falls, New York.	Tully, New York.
Macedon, New York.	Turkeytrail, Indian Territory.
Muscogee, Indian Territory.	Vinita, Indian Territory.
Nowata, Indian Territory.	Wewoka, Indian Territory.
Ogalalla, Nebraska.	Whitefield, New Hampshire-Vermont. a
Okmulgee, Indian Territory.	Wilmurt, New York.

GROUP IV.—*New topographic atlas sheets awaiting editorial examination before approval for engraving.*

Anamosa, Iowa.	Fort Payne, Alabama-Georgia. b
Anniston, Alabama. b	Hamilton, Montana-Idaho.
Bald Mountain, Wyoming.	Harney Peak, South Dakota. b
Bonnetterre, Missouri. c	Ironton, Ohio, Kentucky.
Cherry Creek, New York.	Maquoketa, Iowa-Illinois.
Cincinnati East, Ohio-Kentucky.	Paxton, Nebraska.
Cincinnati West, Ohio-Kentucky.	St. Croix Dalles, Minnesota-Wisconsin.
Davenport, Iowa-Illinois.	St. Genevieve, Missouri-Illinois.
Denzer, Wisconsin.	San Jacinto, California.
De Soto, Missouri.	Silver Creek, New York.
Dryden, New York.	Silver Peak, Nevada-California.
Dunkirk, New York.	Snoqualmie, Washington.
Elkader, Iowa-Wisconsin.	Spearfish, South Dakota.
Elk Point, South Dakota-Nebraska-Iowa.	Spokane, Washington-Idaho.
Elsinore, California.	Tipton, Iowa.
Engineer Mountain, Colorado.	Waterville, Washington.
Flatonia, Texas.	Westfield, New York.
	Winslow, Arkansas-Indian Territory.

a Called Lancaster in Nineteenth Annual Report.

b Resurvey.

c Redrawn.

List of atlas and other sheets revised, corrected, and approved for new editions during the year 1898-99.

Anaheim, California.	New York City and vicinity, New York-New Jersey.
Baltimore, Maryland.	Nomini, Maryland-Virginia.
Block Island, Rhode Island.	Norridgewock, Maine.
Brooklyn, New York.	Oneida, New York.
Clove, New York.	Palo Alto, California.
Conventional Signs sheet.	Paterson, New Jersey-New York.
Cranberry, North Carolina-Tennessee.	Plainfield, New Jersey.
Crandall, Wyoming. ^a	Rhinebeck, New York.
Germantown, Pennsylvania-New Jersey.	Rico, Colorado.
Gray, Maine.	Rochester, New York.
Greylock, Massachusetts-Vermont.	San Francisco, California.
Harlem, New York-New Jersey.	San Jose, California.
Huntington, West Virginia-Ohio-Kentucky.	San Mateo, California.
Ishawooa, Wyoming.	Santa Monica, California.
Kaaterskill, New York.	Standingstone, Tennessee.
Kennebunk, Maine.	Staten Island, New York-New Jersey.
Lake Placid, New York.	Syracuse, New York.
Lebanon, Pennsylvania.	United States, Topographic Index Map.
Londonderry, Vermont.	Watertown, New York.
Mooers, New York.	Whitehall, New York-Vermont.
Muskeget, Massachusetts.	Wilmington, Vermont.

DIVISION OF ENGRAVING AND PRINTING.

Mr. S. J. Kübel was continued in charge of this division, as chief engraver, assisted by Mr. H. C. Evans, foreman of copperplate engravers; Mr. R. H. Payne, in charge of transferring to stone; Mr. J. Eckert, in charge of the work of the lithographic power presses, and Mr. O. Schleichert, in charge of the stone work. There were also employed 18 copperplate engravers, 3 photomechanical engravers, 5 lithographic engravers, and 37 printers, transferrers, and assistants.

The work of the division was, as in previous years, devoted to the engraving and printing of topographic maps and geologic folios, the printing of photolithographic work in connection with the work of the Survey of Indian Territory, and incidental miscellaneous work.

Two important improvements are noted in connection with the photomechanical branch of the division. One of these processes is the reduction of manuscript maps, field sheets, etc., to publication scale ready for engraving. This is an important aid to the Topographic Branch in the work of preparing

^a Formerly called Crandall Creek.

manuscript. The other process is one invented and perfected outside of the office by Messrs. E. H. Daniel, J. W. Painter, and S. J. Kübel. It has for its object the rapid and accurate transferring of original matter to metal plates. This process, in most cases, takes the place of laborious hand tracing, and it is estimated that on the regular Survey work the saving in time will be from three to six weeks per atlas sheet. Applied to reduction of field sheets to publication scale, it will effect a further saving of about six weeks of a draughtsman's time. In the engraving of structure and columnar sections for geologic folios this process entirely eliminates the work of tracing, which formerly called for special skill and attention.

At the beginning of the fiscal year the new large pressroom was put in shape and all power presses were installed therein. A No. 3 Hoe lithographic press was added, making a total of 7 steam lithographic presses, 2 steam type presses, and 8 hand lithographic presses.

One of the growing and important items of time consumption is the work of corrective revision of the plates of the 1,028 atlas sheets now engraved. To this the yearly addition of from 50 to 60 new sheets necessitates corrections when new editions are printed. Mr. Kübel estimates the amount spent in correction of copperplates to be \$6,000. This results mainly from the changes caused by the settlement and development of the various sections of the country.

In addition to the regular work on the topographic and geologic maps there was considerable engraving and printing of miscellaneous subjects. Of this class the 12,000 edition of the 3-sheet map of the United States formed one of the largest items of expenditure of labor and material. The index map and the Land Office plats of the Indian Territory surveys formed another important item.

An edition of 20,000 copies of the special pamphlet on Alaska, provided for by Public Resolution No. 25, Fifty-fifth Congress, third session, was nearly finished June 30. The pamphlet includes 140 pages of text and 10 maps. The base for one of the maps was furnished by the Coast and Geodetic Survey.

Folio No. 2 of the topographic folios is in hand and will soon be printed.

Within the year work was begun on 50 new topographic atlas sheets, 52 sheets were finished, and on 202 sheets more or less extensive corrections were made. The total number of copies of topographic sheets printed was 405,436. Of geologic folios completed there were 7, and at the close of the year 7 others were in press and 5 in preparation. The total number of copies of geologic folios printed was 52,765. In addition there were printed in this division 281,244 copies of miscellaneous material, such as maps for the Alaska pamphlet, Land Office plats, circulars, etc.

ADMINISTRATIVE BRANCH.

DIVISION OF DOCUMENTS, CORRESPONDENCE, AND RECORDS.

This division was continued in general charge of the chief clerk, Col. H. C. Rizer, the custody and distribution of the documents and stationery being under the immediate charge of Dr. W. D. Wirt, and the files and records of correspondence and appointments in charge of Dr. W. F. Morsell, after the resignation of Mr. John R. Walsh, in December, 1898.

DOCUMENTS AND STATIONERY.

The work of this section has increased during the last year, owing to the growth in publication and in the activities of the Survey generally; but Dr. Wirt and his assistants have performed it in a most satisfactory manner. A large room for the storage and handling of maps was secured in the annex, and a larger cellar for the books and folios beneath the main building.

During the year 104,665 volumes, 29,597 geologic folios, and 168,641 topographic maps were sent out, including those distributed under special Congressional enactments. The postal authorities handled this large amount of material promptly and without the loss of any important parcel.

The publications received were: Eighteenth Annual Report, Parts II and III, and "separates" from same; Nineteenth

Annual Report, Parts I, IV, VI, and VI (continued), and a portion of "separates" from same; Bulletins 89, 150 to 156, inclusive; Monographs XXIX, XXX, XXXI, and XXXV; Water-Supply and Irrigation Papers 17 to 26, inclusive; Geologic folios 38, 42 to 50, inclusive; and 234 separate maps, including reissue, a total of 417,865 sheets.

The proceeds from the sale of publications amounted to \$4,330.78, of which \$2,625.69 was received for maps.

During the year 484 requisitions for stationery and supplies were made upon the Department, and 2,796 office requisitions were filled. Letters relating to documents, stationery, etc., to the number of 36,930 were received, and 37,661 were sent out.

CORRESPONDENCE AND RECORDS.

The register of letters of a general character received shows that 4,800 communications were briefed, recorded, and appropriately referred for action, and ultimately placed on file when no longer required for answer or other use. The record of letters sent aggregates about 5,000 typewritten pages.

The work of this section also includes all records pertaining to appointments, to attendance and leaves of absence, and to photographic work, and embraces also the care and custody of the lantern-slide collection and the preparation of quarterly reports to the Department.

About 750 photographic orders were recorded, all of which were receipted for on completion of the work. To the lantern-slide collection over 700 additions were made during the year.

The appointment records show changes to have occurred during the year as follows: Appointments by the Secretary of the Interior (including limited and emergency appointments and mere changes of designation — all except promotions), 110; promotions, 78; reductions, none; resignations, deaths, and transfers to other branches of the service, 26; dismissals, 1; reinstatements, 2; appointments and transfers from field to office, made under special authorization from the Secretary, 18. All "authorizations" that did not expire during the year have been replaced, at the Director's request, by regular appointments, thus doing away with the "authorized" list.

DIVISION OF DISBURSEMENTS AND ACCOUNTS.

This division remained in charge of Mr. John D. McChesney, chief disbursing clerk, throughout the year. The efficiency of the division has been maintained, as evidenced by the favorable reports made by the special agents of the Treasury Department.

A summarized statement of disbursements follows, and a detailed statement is preserved in the office.

Financial Statement.

Analysis of disbursements.

Under the following heads appear the total expenditures under the various appropriations:

1. Salaries, office of Geological Survey	\$31,201.59
2. Salaries of scientific assistants	29,803.52
3. Skilled laborers and various temporary employees	12,998.85
4. Topography	177,488.02
5. Geology	106,871.11
6. Paleontology	9,712.00
7. Chemical and physical researches	6,504.55
8. Preparation of illustrations	13,267.94
9. Mineral resources of the United States	19,748.03
10. Books for library, etc	1,345.39
11. Gauging streams, etc	44,235.36
12. Rent of office rooms, Washington, D. C.	6,199.80
13. Coal and gold resources of Alaska	4,833.86
14. Engraving and printing geological maps of the United States	58,879.47
15. Irrigation investigations, Gila River and Queen's Creek, Arizona	12,463.85
16. Surveying forest reserves	150,286.97
17. Maps of Alaska, Geological Survey	3,728.64
18. Locating the ninety-eighth meridian	850.18
Total	690,417.13

Amounts appropriated for and expended by the United States Geological Survey for the fiscal year ending June 30, 1899.

	Geological Survey, 1899.	Irrigation in Gila River and Queen's Creek, Arizona.	Surveying for- east reserves.	Geological maps of the United States, 1899.	Salaries, office of Geological Survey, 1899.	Locating the ninety-eighth meridian.	Maps of Alaska, Geological Survey.	Total.
Balance available from prior year.....								
Appropriations, 1899: Acts approved March 15, 1898; July 1, 1898; March 1, 1899, and March 3, 1899.....	\$447,100.00	\$20,000.00	(\$23,598.11) 150,000.00	\$60,000.00	\$31,390.00	\$6,300.00	\$4,200.00	\$742,598.11
Amount expended, classified as follows:								
A. Services.....	326,451.54	6,901.13	97,267.57	48,893.89	31,201.59	598.20	1,121.65	512,435.57
B. Traveling expenses.....	20,516.31	343.45	10,290.09	102.10	.....	6.00	.....	31,257.95
C. Transportation of property.....	4,600.13	118.81	3,122.56	70.70	.....	7.71	.....	7,919.91
D. Field subsistence.....	24,790.32	1,988.05	15,930.35	.....	.....	110.60	.....	42,819.33
E. Field supplies and expenses.....	27,537.09	2,081.24	15,288.85	.....	.....	83.65	.....	44,790.83
F. Field material.....	4,246.53	779.25	2,935.47	.....	.....	32.00	.....	7,993.25
G. Instruments.....	5,692.42	39.85	2,247.44	.....	.....	12.02	.....	7,991.73
H. Laboratory material.....	1,670.72	.....	.....	.....	.....	.....	.....	1,670.72
I. Photographic material.....	1,273.89	9.45	666.61	.....	.....	.....	.....	1,949.95
K. Books and maps, etc.....	1,677.17	.....	38.04	.....	.....	.....	.....	1,715.21
L. Stationery and drawing material.....	1,643.53	34.90	259.51	.....	.....	.....	.....	1,937.94
M. Illustrations for reports.....	2,574.55	.....	.....	.....	.....	.....	.....	2,574.55
N. Office rents.....	6,300.92	.....	.....	.....	.....	.....	.....	6,300.92
O. Office furniture.....	1,151.45	.....	159.35	.....	.....	.....	.....	1,310.80
P. Office supplies and repairs.....	1,311.85	24.70	197.66	.....	.....	.....	.....	1,534.21
Q. Storage.....	239.93	20.00	263.69	.....	.....	.....	.....	513.62
R. Correspondence.....	339.36	19.24	246.88	.....	.....	.....	.....	605.74
S. Materials for engraving and printing maps.....	.....	.....	.....	9,812.52	.....	.....	.....	12,419.51
T. Railroad accounts settled at U. S. Treasury:								
Passenger.....	1,174.28	.....	1,015.17	.....	.....	.....	.....	2,189.45
Freight.....	14.44	103.78	367.73	.....	.....	.....	.....	485.95
Total expenditures.....	433,006.43	12,463.85	150,286.97	58,879.47	31,201.59	850.18	3,728.64	690,417.13
Balance unexpended July 1, 1899.....	14,093.57	7,536.15	23,311.14	1,120.53	188.41	5,449.82	471.36	52,170.96
Probable amount required to meet outstanding liabilities.....	14,093.57	7,536.15	23,311.14	1,120.53	.....	5,449.82	471.36	51,982.57

THE LIBRARY.

The library of the Survey was continued under the charge of Mr. Charles C. Darwin, assisted by Miss Julia L. McCord, Miss M. E. Latimer, and Mr. Thomas K. Gallaher.

During the year vigorous means were taken to supply some of the most pressing needs of the library. The amount available for the purchase of books has been more and more encroached upon by the cost of handling the foreign exchanges. On this account a careful revision of the exchange list has been made, with a view of bringing to the library by this means the utmost increase. The new exchange list resulting from this revision, and based upon many years' experience, was put into operation within the year. It contains 1,707 addresses, 820 of which receive complete exchange. The map-distribution list has also been revised, with the view not only of placing the maps of the Survey where they will be most useful and most accessible in the United States, but also of procuring a return from the great map-producing agencies of the world. This list is limited to 443 addresses, the greater number of which are domestic. These lists are appended to this report (p. 164).

From these exchanges the library receives a steady income of picked and valuable books and papers. Special exchanges made during the year brought in a considerable addition of current books of geography and travel and a number of needed older scientific works. Purchases of treatises needed to round out different sections of the library were made abroad, in England, France, and Germany; the books from England are now in the hands of cataloguers; the cases from France and Germany are yet upon the way.

The long blockade in binding has been broken and the difficulties arising from the circulation and use of a great accumulation of books unbound and in parts will soon be greatly reduced. Within the last few months 1,500 books have been collated, arranged, and sent to the bindery. They were selected with great care to include those most used and most liable to damage or loss. The same generous treatment from

the Department should bind in the coming year at least half of the 6,000 unbound volumes.

The additional room secured for the care of maps has made possible the construction of twelve new map cases that will allow of the convenient storage of the larger accumulation of maps, which has been for some time so troublesome to handle. This and the additional room for the storage of duplicates and little-used books will lighten very materially the labors of the limited library force. There is still needed the apparatus for a subject index and a skilled cataloguer, in order to increase the usefulness of the library.

The additions during the year were 1,700 books, 3,350 pamphlets, and 250 maps—a total of 5,300. Of these, 1,265 books, 2,800 pamphlets, and over 230 maps were received in exchange for Survey publications.

Contents of the library June 30, 1899.

BOOKS.	
On hand June 30, 1898:	
Received by exchange	30, 630
Received by purchase	11, 715
	———— 42, 345
Received during the last year:	
By exchange	1, 265
By purchase	435
	———— 1, 700
	———— 44, 045
PAMPHLETS.	
On hand June 30, 1898:	
Received by exchange	55, 079
Received by purchase	13, 761
	———— 68, 840
Received during the last year:	
By exchange	2, 800
By purchase	550
	———— 3, 350
	———— 72, 190
MAPS.	
Geologic and topographic maps:	
On hand June 30, 1898	27, 885
Received during the year	250
	———— 28, 135
	———— 144, 370

EXCHANGES.

The Survey has now 1,707 correspondents who, by virtue of maintaining a regular exchange of geologic and geographic material, are entitled to its publications. They may be classified as follows:

Foreign	1,107, of which 542 receive all publications.
Domestic.....	600, of which 278 receive all publications.
In all	1,707, of which 820 receive all publications, and 887 receive Annual Reports.

List of exchanges.

CANADA.

- 114 J. B. Tyrrell, Dawson, Yukon.
- 3 Murchison Scientific Society, Belleville, Ont.
- 6 Library of the Legislative Assembly, Charlottetown, P. E. Island.
- 9 Peter McKellar, Esq., Fort William, Ont.
- 12 Department of Agriculture, Fredericton, N. B.
- 15 University of New Brunswick, Fredericton, N. B.
- 21 Department of Mines, Province Buildings, Halifax, N. S.
- 24 Mining Society of Nova Scotia, Halifax, N. S.
- 27 Nova Scotian Institute of Science, Halifax, N. S.
- 30 Hamilton Association, Hamilton, Ont.
- 33 Prof. Wm. L. Goodwin, Kingston, Ont.
- 36 School of Mining, Kingston, Ont.
- 39 Entomological Society of Ontario, London, Ont.
- 42 Canadian Society of Civil Engineers, Montreal.
- 45 McGill University, Montreal.
- 48 Montreal Natural History Society, Montreal.
- 51 Numismatic and Antiquarian Society of Montreal, Montreal
- 54 Prof. D. P. Penhallow, Montreal.
- 57 Société Historique de Montreal, Montreal.
- 60 Prof. Henry M. Ami, Ottawa.
- 63 Dr. Robert Bell, Ottawa.
- 66 Canadian Mining and Mechanical Review, Ottawa.
- 69 Canadian Mining Institute, Montreal.
- 72 Robert Chalmers, Ottawa.
- 75 Prof. George M. Dawson, Ottawa.
- 78 Department of Agriculture, Ottawa.
- 84 Hugh Fletcher, Ottawa.
- 87 Geological and Natural History Survey of Canada, Ottawa.
- 90 Elfric Drew Ingall, Ottawa.
- 93 R. G. McConnell, Ottawa.
- 96 Thomas Macfarlane, Ottawa.
- 99 Prof. John Macoun, Ottawa.
- 102 Ottawa Field-Naturalists' Club, Ottawa.
- 103 Ottawa Literary and Scientific Society, Ottawa.
- 105 Royal Society of Canada, Ottawa.
- 117 J. F. Whiteaves, Ottawa.
- 120 Wm. J. Wilson, Ottawa.
- 123 Department of Colonization and Mines, Quebec.

- 126 Geographical Society of Quebec, Quebec.
- 129 Prof. J. C. K. Laflamme, Quebec.
- 132 Library of the Legislature of Quebec, Quebec.
- 135 Quebec Literary and Historical Society, Quebec.
- 138 The North West Government Library, Regina, N. W. Territory.
 - 81 W. F. Ferrier, Roseland, B. C.
- 141 George F. Matthew, St. John, N. B.
- 144 Natural History Society of New Brunswick, St. John, N. B.
- 147 Geological Survey of Newfoundland, St. Johns, Newfoundland.
- 150 James P. Howley, St. Johns, Newfoundland.
- 153 Henry Skeffington Poole, Stellarton, N. S.
- 156 Bureau of Mines, Toronto.
- 159 Canadian Institute, Toronto.
- 162 University of Toronto, Toronto.
- 108 Dr. Alfred R. C. Selwyn, Vancouver, B. C.
- 164 Department of Mines, Victoria, B. C.
- 165 Library, Legislative Assembly, Victoria, B. C.
- 166 Natural History Society, Victoria, B. C.
- 168 Historical and Scientific Society, Winnipeg, Manitoba.
- 171 Provincial Library, Winnipeg, Manitoba.

MEXICO.

- 174 Prof. Carlos Romero, Guanajuato.
- 177 José G. Aguilera, City of Mexico.
- 180 Escuela Nacional de Ingenieros, City of Mexico.
- 183 Instituto Geológico de México, City of Mexico.
- 186 El Museo Nacional, City of Mexico.
- 189 Observatorio Astronómico Nacional de Tacubaya, City of Mexico.
- 192 Ezequiel Ordoñez, City of Mexico.
- 195 Secretario de Fomento (Sección de Cartografía), City of Mexico.
- 198 Sociedad Científica Antonio Alzate, City of Mexico.
- 201 Sociedad Mexicana de Geografía y Estadística, City of Mexico.
- 204 Sociedad Mexicana de Historia Natural, City of Mexico.

UNITED STATES.

ALABAMA.

- 207 Alabama Industrial and Scientific Society, University P. O.
- 210 Geological Survey of Alabama, University P. O.
- 213 Henry McCalley, University P. O.
- 216 Prof. Eugene A. Smith, University P. O.

ARIZONA.

- 219 Territorial Geologist, Prescott.
- 222 Arizona Normal School, Tempe.
- 225 William P. Blake, Tucson.

ARKANSAS.

- 231 Bureau of Mines, Manufactures, and Agriculture, Little Rock.

CALIFORNIA.

- 237 Prof. Eugene W. Hilgard, Berkeley.
- 240 Prof. Andrew C. Lawson, Berkeley.
- 243 Dr. Joseph Le Conte, Berkeley.

- 246 Library of the University of California, Berkeley.
- 249 Historical Society of Southern California, Los Angeles.
- 252 Southern California Academy of Sciences, Los Angeles.
- 1344 James Edward Keeler, Mount Hamilton.
- 291 Lick Observatory, Mount Hamilton.
- 1260 Prof. Edward W. Claypole, Pasadena.
- 253 Pasadena Academy of Sciences, Pasadena.
- 255 Annual Statistician (L. P. McCarty, editor), San Francisco.
- 258 Bohemian Club Library, San Francisco.
- 261 California Academy of Sciences, San Francisco.
- 264 California State Mining Bureau, San Francisco.
- 267 Prof. George Davidson, San Francisco.
- 270 Geographical Society of California, San Francisco.
- 273 Geographical Society of the Pacific, San Francisco.
- 276 Henry G. Hanks, San Francisco.
- 513 Miss Lillie J. Martin, San Francisco.
- 280 Curtis H. Lindley, San Francisco.
- 279 Louis Janin, jr., San Francisco.
- 282 Mining and Scientific Press, San Francisco.
- 285 Sierra Club, San Francisco.
- 288 Technical Society of Pacific Coast, San Francisco.
- 294 Santa Barbara Society of Natural History, Santa Barbara.
- 297 Dr. L. G. Yates, Santa Barbara.
- 300 Prof. J. S. Branner, Stanford University.
- 303 Prof. D. H. Campbell, Stanford University.
- 306 Prof. D. S. Jordan, Stanford University.

COLORADO.

- 309 Colorado College Scientific Society, Colorado Springs.
- 312 F. W. Cragin, Colorado Springs.
- 315 Prof. George H. Stone, Colorado Springs.
- 321 Colorado Scientific Society, Denver.
- 322 Colorado State Mining Bureau, Denver.
- 324 Denver Society of Civil Engineers, Denver.
- 328 Irrigation Era, Denver.
- 330 Mining Industry and Review, Denver.
- 333 State Engineer, Denver.
- 335 State Historical and Natural History Society, Denver.
- 336 State Inspector of Coal Mines, Denver.
- 318 American Society of Irrigation Engineers, Fort Collins.
- 339 Prof. W. P. Headden, Fort Collins.
- 342 State Agricultural College, Fort Collins.
- 345 Prof. H. B. Patton, Golden.
- 348 State School of Mines, Golden.
- 349 Western Colorado Academy of Sciences, Grand Junction.

CONNECTICUT.

- 351 Connecticut Historical Society, Hartford.
- 354 Meriden Scientific Association, Meriden.
- 357 American Journal of Science, New Haven.
- 360 Chas. E. Beecher, New Haven.
- 363 Prof. William H. Brewer, New Haven.
- 366 Prof. George J. Brush, New Haven.
- 369 Connecticut Academy of Arts and Sciences, New Haven.
- 372 Connecticut Agricultural Experiment Station, New Haven.

- 375 Prof. Edward S. Dana, New Haven.
- 378 Prof. F. A. Gooch, New Haven.
- 384 Prof. Samuel L. Penfield, New Haven.
- 387 Louis V. Pirsson, New Haven.
- 390 Prof. H. L. Wells, New Haven.
- 393 Prof. Henry S. Williams, New Haven.

FLORIDA.

- 396 Southern Society of Civil Engineers, Jacksonville.
- 399 St. Augustine Scientific and Literary Institute, St. Augustine.
- 402 Commissioner of Agriculture, Tallahassee.

GEORGIA.

- 405 Geological Survey of Georgia, Atlanta.
- 408 William S. Yeates, Atlanta.

ILLINOIS.

- 465 American Antiquarian, Chicago.
- 414 Dr. H. M. Bannister, Chicago.
- 417 Prof. T. C. Chamberlin, Chicago.
- 420 Chicago Academy of Sciences, Chicago.
- 423 Chicago Public Library, Chicago.
- 426 Prof. J. M. Coulter, Chicago.
- 429 Field Columbian Museum, Chicago.
- 432 Prof. J. P. Iddings, Chicago.
- 435 Irrigation Age, Chicago.
- 439 Machinery and Supplies for Mines and Mills, Chicago.
- 441 Newberry Library, Chicago.
- 444 Polytechnical Society, Chicago.
- 447 Rand, McNally & Co., Chicago.
- 450 Prof. R. D. Salisbury, Chicago.
- 453 Rev. F. X. Shulak, Chicago.
- 459 University of Chicago (Geological Department), Chicago.
- 460 University of Chicago Library, Chicago.
- 462 Western Society of Engineers, Chicago.
- 411 Illinois Society of Engineers and Surveyors, Peoria.
- 466 Augustana College, Rock Island.
- 468 Geological Survey of Illinois, Springfield.
- 471 W. F. E. Gurley, Springfield.
- 474 State Board of Agriculture, Springfield.
- 477 State Bureau of Labor Statistics, Springfield.
- 480 State Museum of Natural History, Springfield.
- 483 State Laboratory of Natural History, Urbana.
- 486 Prof. C. W. Rolfe, Urbana.
- 489 University of Illinois, Urbana.
- 492 State Horticultural Society, Warsaw.

INDIANA.

- 495 Brookville Society of Natural History, Brookville.
- 500 Dr. M. N. Elrod, Columbus.
- 501 Prof. J. L. Campbell, Crawfordsville.
- 507 W. S. Blatchley, Indianapolis.
- 510 Department of Geology and Natural Resources, Indianapolis.
- 498 Indiana Academy of Science, Indianapolis.
- 519 A. J. Phinney, Muncie.
- 522 Dr. John Collett, Newport.

IOWA.

- 525 Prof. Samuel W. Beyer, Ames.
- 528 Experiment Station, Iowa Agricultural College, Ames.
- 534 Davenport Academy of Natural Sciences, Davenport.
- 540 H. Foster Bain, Des Moines.
- 543 Geological Survey of Iowa, Des Moines.
- 546 Iowa Academy of Sciences, Des Moines.
- 549 Office of State Mine Inspector, Des Moines.
- 552 A. H. Conrad, Fairfield.
- 555 Prof. Samuel Calvin, Iowa City.
- 558 State University of Iowa, Iowa City.
- 561 Prof. William H. Norton, Mount Vernon.
- 564 Scientific Association, Sioux City.

KANSAS.

- 570 Prof. Erasmus Haworth, Lawrence.
- 573 University of Kansas, Lawrence.
- 573 Leavenworth Academy of Science, Leavenworth.
- 579 J. C. Cooper, Topeka.
- 582 Kansas Academy of Science, Topeka.
- 585 State Board of Agriculture, Topeka.
- 588 State Historical Society, Topeka.

KENTUCKY.

- 597 State Agricultural Society, Frankfort.
- 603 Agricultural Experiment Station, Lexington.
- 600 State Geological Department, Lexington.
- 606 Ohio Falls Geological Society, Louisville.
- 609 E. O. Ulrich, Newport.

LOUISIANA.

- 612 Louisiana State University, Baton Rouge.
- 615 Prof. J. W. Caldwell, New Orleans.
- 616 Louisiana Geological Survey, New Orleans.

MAINE.

- 621 State Board of Agriculture, Augusta.
- 618 Prof. Lealie A. Lee, Brunswick.
- 624 Portland Society of Natural History, Portland.
- 627 White Mountain Club, Portland.
- 630 Prof. W. S. Bayley, Waterville.

MARYLAND.

- 633 U. S. Naval Academy, Annapolis.
- 636 Dr. W. B. Clark, Baltimore.
- 639 Geological Survey of Maryland, Baltimore.
- 642 Johns Hopkins University, Baltimore.
- 645 Maryland Academy of Sciences, Baltimore.
- 648 Peabody Institute Library, Baltimore.
- 651 Prof. Philip R. Uhler, Baltimore.
- 654 Maryland Agricultural Experiment Station, College Park.

MASSACHUSETTS.

- 657 Dr. Benjamin K. Emerson, Amherst.
- 660 American Academy of Arts and Sciences, Boston.

- 663 Appalachian Mountain Club, Boston.
- 666 Boston Athenæum, Boston.
- 669 Boston Public Library, Boston.
- 672 Boston Scientific Society, Boston.
- 675 Boston Society of Civil Engineers, Boston.
- 678 Boston Society of Natural History, Boston.
- 681 William O. Crosby, Boston.
- 687 Prof. Alpheus Hyatt, Boston.
- 690 Dr. David F. Lincoln, Boston.
- 693 Massachusetts State Library, Boston.
- 696 R. H. Richards, Boston.
- 699 Society of Arts of the Massachusetts Institute of Technology, Boston.
- 702 Prof. Alexander Agassiz, Cambridge.
- 705 Mrs. Elizabeth C. Agassiz, Cambridge.
- 1377 American Naturalist, Cambridge.
- 1584 Annals of Mathematics, Cambridge.
- 708 Prof. W. M. Davis, Cambridge.
- 711 Harvard College Library, Cambridge.
- 714 Harvard University, Department of Mining and Metallurgy, Cambridge.
- 717 Harvard College, Museum of Comparative Zoology, Cambridge.
- 720 Harvard College—Peabody Museum, Cambridge.
- 723 Harvard University Museum, Mineralogical Section, Cambridge.
- 725 T. A. Jaggar, Jr., Cambridge.
- 729 Samuel H. Scudder, Cambridge.
- 732 Prof. Nathaniel S. Shaler, Cambridge.
- 735 Prof. John E. Wolff, Cambridge.
- 738 Rev. Horace C. Hovey, Newburyport.
- 744 Essex Institute, Salem.
- 747 Prof. Edward S. Morse, Salem.
- 750 Peabody Academy of Science, Salem.
- 753 Prof. T. Nelson Dale, Williamstown.
- 756 American Antiquarian Society, Worcester.
- 759 Prof. Thomas C. Mendenhall, Worcester.
- 762 Joseph H. Perry, Worcester.

MICHIGAN.

- 765 Adrian Scientific Society, Adrian.
- 768 J. Kost, Adrian.
- 771 Prof. William H. Pettee, Ann Arbor.
- 774 Albert B. Prescott, Ann Arbor.
- 777 Prof. I. C. Russell, Ann Arbor.
- 780 William M. Courtis, Mining Engineer, Detroit.
- 786 Dr. Lucius L. Hubbard, Houghton.
- 792 Dr. Marshman E. Wadsworth, Houghton.
- 783 Board of Geological Survey of Michigan, Lansing.
- 789 Dr. Alfred C. Lane, Lansing.
- 795 State Agricultural Society, Lansing.
- 798 Charles D. Lawton, Lawton.

MINNESOTA.

- 801 American Geologist, Minneapolis.
- 804 Geological and Natural History Survey of Minnesota, Minneapolis.
- 807 Geological and Natural History Survey, Botanical Division, Minneapolis.
- 810 Prof. Christopher W. Hall, Minneapolis.
- 813 Minnesota Academy of Natural Sciences, Minneapolis.

- 816 State University of Minnesota, Minneapolis.
822 Prof. Newton H. Winchell, Minneapolis.
825 Wm. H. Phipps, St. Paul.
828 St. Paul Academy of Natural Sciences, St. Paul.
831 Prof. Warren Upham, St. Paul.

MISSOURI.

- 834 Prof. Garland C. Broadhead, Columbia.
837 Bureau of Geology and Mines, Jefferson City.
840 Kansas City Academy of Science, Kansas City.
841 Kansas City College of Pharmacy and Natural Sciences, Kansas City.
843 Prof. Arthur Winslow, Kansas City.
846 Academy of Science of St. Louis, St. Louis.
849 Age of Steel, St. Louis.
852 Mississippi River Commission, St. Louis.
855 Missouri Botanical Garden, St. Louis.
858 Missouri River Commission, St. Louis.
861 Prof. William B. Potter, St. Louis.
864 F. A. Sampson, Sedalia.

MONTANA.

- 819 H. V. Winchell, Butte.
867 Arthur Benj. Brown, Coloma.
504 N. R. Leonard, Libby.

NEBRASKA.

- 873 State Board of Agriculture, Brownville.
876 Prof. Charles E. Bessey, Lincoln.
879 Nebraska Academy of Sciences, Lincoln.
882 Nebraska Historical Society, Lincoln.

NEVADA.

- 885 Surveyor General of Nevada, Carson City.
888 Robert D. Jackson, Reno.

NEW HAMPSHIRE.

- 891 Markinfield Addey, Bethlehem.
894 Exeter Natural History Society, Exeter.
897 Prof. Charles H. Hitchcock, Hanover.
900 Prof. Thaddeus W. Harris, Keene.

NEW JERSEY.

- 902 Dr. Henry S. Washington, Locust.
903 Mineral Collector, Newark.
909 Prof. Albert H. Chester, New Brunswick.
912 New Jersey State Microscopical Society, New Brunswick.
915 E. M. Museum of Geology and Archaeology, Princeton.
916 J. B. Hatcher, Princeton.
918 Prof. C. G. Rockwood, Princeton.
921 Prof. W. B. Scott, Princeton.
924 Geological Survey, Trenton.
927 Prof. John C. Smock, Trenton.
930 Trenton Natural History Society, Trenton.

NEW MEXICO.

- 933 C. H. Tyler Townsend, Las Cruces.
- 936 Frank Springer, Las Vegas.
- 591 Orestes H. St. John, Raton.
- 939 Historical Society of New Mexico, Santa Fe.
- 942 New Mexico School of Mines, Socorro.

NEW YORK.

- 945 Adirondack Survey, Albany.
- 948 Albany Institute, Albany.
- 951 Prof. John M. Clarke, Albany.
- 954 Geological Survey of New York, Albany.
- 957 Charles E. Hall, Albany.
- 963 F. J. H. Merrill, Albany.
- 966 State Agricultural Society, Albany.
- 969 State Engineer and Surveyor, Albany.
- 972 State Library, Albany.
- 975 State Museum of Natural History, Albany.
- 1641 Prof. Albert R. Crandall, Alfred.
- 978 Brooklyn Institute, Brooklyn.
- 981 Brooklyn Library, Brooklyn.
- 516 Prof. Richard Ellsworth Call, Brooklyn.
- 987 Rossiter W. Raymond, Brooklyn.
- 990 Williamsburgh Scientific Society, Brooklyn.
- 993 Irving P. Bishop, Buffalo.
- 996 Buffalo Microscopical Club, Buffalo.
- 999 Buffalo Society of Natural Sciences, Buffalo.
- 1002 Dr. Julius Pohlman, Buffalo.
- 1005 Prof. Charles H. Smyth, jr., Clinton.
- 1008 Wm. H. Benedict, Elmira.
- 1011 George Geddes, Fairmount.
- 1014 Prof. Josef Zervas, Flushing.
- 1017 Capt. Anthony W. Vogdes, U. S. A., Fort Wadsworth, S. I.
- 1020 New York Agricultural Experiment Station, Geneva.
- 1023 The Military Service Institution of the United States, Governors Island.
- 1026 Cornell University Library, Ithaca.
- 1029 Prof. E. A. Fuertes, Ithaca.
- 1032 Gilbert D. Harris, Ithaca.
- 1034 Heinrich Ries, Ithaca.
- 1035 R. S. Tarr, Ithaca.
- 1038 Robert H. Thurston, Ithaca.
- 1041 Dr. Cooper Curtice, Moravia.
- 1050 Charles Earle, Mt. Vernon.
- 1044 Natural Science Association of Staten Island, New Brighton, S. I.
- 1047 Major Thomas B. Brooks, Newburgh.
- 1053 Cyrus C. Adams, New York City.
- 1056 Joel A. Allen, New York City.
- 1059 American Book Company, New York City.
- 1062 American Chemical Society, New York City.
- 1065 American Engineer and Railroad Journal, New York City.
- 1068 American Geographical Society, New York City.
- 1071 American Institute of Mining Engineers, New York City.
- 1074 American Mathematical Society, New York City.
- 1077 American Metrological Society, New York City.
- 1080 American Museum of Natural History, New York City.

- 1083 American Society of Civil Engineers, New York City.
1086 American Society of Mechanical Engineers, New York City.
1089 Appleton's Popular Science Monthly, New York City.
1095 The Ark, New York City.
1098 Prof. A. S. Bickmore, New York City.
1101 Dr. Franz Boas, New York City.
1104 John A. Church, New York City.
1107 Columbia University Library, New York City.
1108 Columbia University, Department of Metallurgy, New York City.
1110 James Douglas, New York City.
1113 Prof. Thomas Eggleston, New York City.
1116 Electrical Review Publishing Company, New York City.
1119 Engineering and Mining Journal, New York City.
1120 Engineering News, New York City.
1122 Forest and Stream, New York City.
1123 The Forum, New York City.
1125 James T. Gardiner, New York City.
1128 L. P. Gratacap, New York City.
1131 James D. Hague, New York City.
1134 Dr. William Hallock, New York City.
1137 Harper & Brothers, New York City.
1140 Dr. Arthur Hollick, New York City.
684 Henry M. Howe, New York City.
1142 Journal of School Geography, New York City.
1143 Prof. J. F. Kemp, New York City.
1146 Hon. James P. Kimball, New York City.
1149 George F. Kunz, New York City.
1152 Daniel W. Langton, jr., New York City.
1155 Hon. Clarence King, New York City.
1158 Prof. D. S. Martin, New York City.
1161 Geo. W. Maynard, New York City.
1164 Prof. H. S. Munroe, New York City.
1167 New York Academy of Sciences, New York City.
1170 New York Botanical Garden, New York City.
1173 New York Historical Society, New York City.
1092 New York Public Library, New York City.
1176 Publisher's Weekly, New York City.
1179 Hon. J. B. Randol, New York City.
1185 R. P. Rothwell, New York City.
1188 School of Mines, Columbia University, New York City.
1191 Science, New York City.
1194 Scientific American, New York City.
1197 Prof. J. J. Stevenson, New York City.
456 Stone, New York City.
1200 Technical Society, New York City.
1203 Torrey Botanical Club, New York City.
1206 Gilbert Van Ingen, New York City.
1209 Prof. R. P. Whitfield, New York City.
1212 Prof. R. S. Woodward, New York City.
1215 Prof. William B. Dwight, Poughkeepsie.
1218 Vassar Brothers' Institute, Poughkeepsie.
1221 Prof. Herman LeRoy Fairchild, Rochester.
1224 Geological Society of America, Rochester.
1227 Rochester Academy of Science, Rochester.
1233 Jefferson County Historical Society, Watertown.

- 1236 United States Military Academy, West Point.
1239 Engineer School of Application, Willetts Point, Whitestone P. O.

NORTH CAROLINA.

- 1242 Elisha Mitchell Scientific Society, Chapel Hill.
1251 Geological Survey of North Carolina, Chapel Hill.
1245 Prof. Joseph A. Holmes, Chapel Hill.
1248 Geological and Biological Laboratory, A. G. Weatherby & Sons, Magnetic City.
1254 North Carolina Agricultural Experiment Station, Raleigh.
1257 Dr. Richard M. Eames, Salisbury.

OHIO.

- 1263 Henry E. Chapin, Athens.
741 American Association for the Advancement of Science, Cincinnati.
1266 Cincinnati Museum Association, Cincinnati.
1266 Cincinnati Public Library, Cincinnati.
1272 Cincinnati Society of Natural History, Cincinnati.
1275 Historical and Philosophical Society of Ohio, Cincinnati.
1278 Josua Lindahl, Cincinnati.
1281 Ohio Mechanics' Institute, Cincinnati.
1287 Henry P. Cushing, Cleveland.
1290 Peter Neff, Cleveland.
1293 Western Reserve Historical Society, Cleveland.
1296 Prof. W. A. Kellermann, Columbus.
1299 Ohio Archaeological and Historical Society, Columbus.
1302 Ohio Climate and Crop Service, Columbus.
1305 Ohio Geological Survey, Columbus.
1308 Ohio State Board of Agriculture, Columbus.
1311 Prof. Edward Orton, Columbus.
531 Prof. Herbert Osborn, Columbus.
1230 Charles S. Prosser, Ohio State University, Columbus.
1314 Denison Scientific Association, Granville.
1317 Matthew C. Read, Hudson.
1320 Oberlin College Library, Oberlin.
1323 Albert A. Wright, Oberlin.
1326 Rev. G. Frederick Wright, Oberlin.
1332 Horace N. Mateer, Wooster.

OREGON.

- 1335 Oregon Agricultural Experiment Station, Corvallis.
1338 Prof. Thomas Condon, Eugene City.
1340 Mazamas, Portland.

PENNSYLVANIA.

- 1341 Allegheny Observatory, Allegheny.
1347 Prof. E. H. Williams, jr., Bethlehem.
1494 American Society of Naturalists, Bryn Mawr.
1350 Miss F. Bascom, Bryn Mawr.
1353 John Eyerman, Easton.
1413 Geological Survey, Harrisburg.
1359 State Agricultural Society, Harrisburg.
1362 Chemical and Physical Society, Lewisburg.
1365 Institute of Science, Media.
1368 Academy of Natural Sciences of Philadelphia, Philadelphia.
1371 American Academy of Political and Social Science, Philadelphia.

- 1374 American Iron and Steel Association, Philadelphia.
- 1380 American Philosophical Society, Philadelphia.
- 1386 John Birkinbine, Philadelphia.
- 1389 Henry M. Chance, M. D., Philadelphia.
- 1392 Edward V. D'Invilliers, Philadelphia.
- 1395 Engineers' Club of Philadelphia, Philadelphia.
- 1398 Franklin Institute, Philadelphia.
- 1401 Dr. Persifor Frazer, Philadelphia.
- 1404 F. Lynwood Garrison, Philadelphia.
- 1407 Prof. Frederick A. Genth, Philadelphia.
- 1410 Geographical Society of Philadelphia, Philadelphia.
- 1416 Prof. Angelo Heilprin, Philadelphia.
- 1419 Prof. J. Peter Lesley, Philadelphia.
- 1422 Library Company of Philadelphia, Philadelphia.
- 1425 Library Company of Philadelphia, Ridgway Branch, Philadelphia.
- 1428 Dr. B. Smith Lyman, Philadelphia.
- 1431 Franklin Platt, Philadelphia.
- 1434 Frederick Prime, Philadelphia.
- 1437 Technical Society, Philadelphia.
- 1440 Wagner Free Institute of Science, Philadelphia.
- 1443 Dr. William H. Wahl, Philadelphia.
- 1446 Academy of Science and Art of Pittsburg, Pittsburg.
- 1449 Engineers' Society of Western Pennsylvania, Pittsburg.
- 1452 Technical Society, Pittsburg.
- 1455 John Franklin Carll, Pleasantville.
- 1458 Baird Halberstadt, Pottsville.
- 1461 Spencer F. Baird Naturalist Association No. 2, Reading.
- 1464 Mines and Minerals, Scranton.
- 1471 Prof. Harry H. Stock, Scranton.
- 1467 Department of Mining Engineering, State College.
- 1470 T. C. Hopkins, State College.
- 1476 State Normal School, West Chester.
- 1479 Wyoming Historical and Geological Society, Wilkesbarre.
- 1482 Prof. A. Wanner, York.

RHODE ISLAND.

- 1485 Prof. Walcott Gibbs, Newport.
- 1488 Newport Natural History Society, Newport.
- 1491 Prof. R. Pumpelly, Newport.
- 1497 Athenaeum Library, Providence.
- 1500 Dr. Carl Barus, Providence.
- 1503 Prof. A. S. Packard, Providence.
- 1506 Rhode Island Historical Society, Providence.
- 1509 Prof. Frank W. Very, Providence.

SOUTH CAROLINA.

- 1512 Charles U. Shepard, Charleston.
- 1515 Department of Agriculture, Columbia.

SOUTH DAKOTA.

- 1518 Walter P. Jenney, Rapid City.
- 1520 State School of Mines, Rapid City.
- 1521 Geological Survey of South Dakota, Vermillion.
- 1524 Prof. James E. Todd, Vermillion.

TENNESSEE.

- 1527 Engineering Society of the University of Tennessee, Knoxville.
- 1530 Bureau of Labor, Statistics, and Mines, Nashville.
- 1533 Prof. James M. Safford, Nashville.

TEXAS.

- 1539 Marshall R. Gaines, Austin.
- 1542 Geological Survey of Texas, Austin.
- 1545 W. H. von Streeruwitz, Austin.
- 1548 Texas Academy of Science, Austin.
- 1536 Prof. E. T. Dumble, Houston.
- 1557 Southwestern Academy of Natural Science, Tyler.

UTAH.

- 1560 Utah Agricultural College Experiment Station, Logan.
- 1563 Prof. Marcus E. Jones, Salt Lake City.
- 1566 Polytechnic Society of Utah, Salt Lake City.

VERMONT.

- 1568 Geological Survey of Vermont, Burlington.
- 1569 Prof. George H. Perkins, Burlington.

VIRGINIA.

- 1572 Prof. H. D. Campbell, Lexington.
- 1575 Dr. W. H. Ruffner, Lexington.
- 1578 Department of Agriculture, Richmond.
- 1587 Prof. William M. Fontaine, University.
- 1590 Prof. J. W. Mallet, University.
- 1593 C. R. Boyd, Wytheville.

WASHINGTON.

- 1596 Bureau of Labor, Olympia.
- 1599 Edmund S. Meary, Seattle.
- 438 Edmund Jussen, Spokane.
- 1602 Mining, Spokane.
- 1605 Spokane Academy of Sciences, Spokane.
- 1611 Tacoma Academy of Sciences, Tacoma.

WEST VIRGINIA.

- 1613 Geological Survey, Morgantown.
- 1614 A. D. Hopkins, Morgantown.
- 1617 Prof. I. C. White, Morgantown.

WISCONSIN.

- 1620 Wisconsin Geographical Society, Crandon.
- 1623 Geological Survey of Wisconsin, Madison.
- 1626 University of Wisconsin, Madison.
- 1629 Prof. C. R. Van Hise, Madison.
- 1632 Washburn Observatory, Madison.
- 1635 Academy of Sciences, Madison.
- 1638 State Historical Society, Madison.
- 1644 Natural History Association, Milwaukee.

WYOMING.

- 1647 Territorial Geologist and Mining Engineer, Cheyenne.

WASHINGTON, D. C.

- 1653 Cleveland Abbe.
- 1656 American Monthly Microscopical Journal.
- 1659 J. Stanley Brown.
- 1662 Bureau of the Mint.
- 1665 Chief of Engineers, U. S. A.
- 1668 Chief Signal Officer, U. S. A.
- 1671 W. H. Dall.
- 1674 Department of Agriculture.
- 1680 Department of the Interior Library.
- 1551 Major C. E. Dutton.
- 1683 Henry Gannett.
- 1686 General Land Office.
- 1689 Georgetown University.
- 1692 Theodore Gill.
- 1696 Edwin E. Howell.
- 1698 Hydrographic Office, Navy Department.
- 1701 Prof. S. P. Langley.
- 1704 Light-House Board.
- 1707 W. J. McGee.
- 1710 Mathematical Magazine, Artemas Martin, Ed.
- 1713 Dr. C. Hart Merriam.
- 1716 Prof. George P. Merrill.
- 1719 National Academy of Sciences.
- 1722 National Geographic Society.
- 1725 Office of Naval Intelligence.
- 1727 Philosophical Society of Washington.
- 1728 Quartermaster-General's Office.
- 1731 Topographer of the Post-Office Department.
- 1734 U. S. Coast and Geodetic Survey.
- 1737 U. S. Commission of Fish and Fisheries.
- 1740 U. S. Engineer Office.
- 1743 Major J. W. Powell.
- 1746 Prof. John R. Procter.
- 1749 Richard Rathbun.
- 1752 Smithsonian Institution.
- 1755 Leonhard Stejneger.
- 1758 U. S. National Museum.
- 1761 U. S. Naval Observatory.
- 1764 Charles D. Walcott.
- 1767 War Department.
- 1770 Dr. C. A. White.

HAWAIIAN ISLANDS.

- 1772 Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History, Honolulu.
- 1773 Hawaiian Historical Society, Honolulu.
- 1776 Arthur Johnston, Honolulu.
- 1779 Surveyor-General's Office, Honolulu.

AFRICA.

- 1782 Académie d'Hippone, Bone, Algeria.
- 1785 Société Archéologique de Constantine, Constantine, Algeria.
- 1788 Commissioner of Crown Lands, etc., Cape Town, Cape of Good Hope.
- 1791 Geological Commission, Cape Town, Cape of Good Hope.

- 1794 Institut Égyptien, Cairo, Egypt.
- 1797 Société Khédiviale de Géographie, Cairo, Egypt.
- 1800 Rev. Richard Baron, Antananarivo, Madagascar.
- 1803 Joseph Carl Auguste Hall, Esq., Durban, Natal.
- 1807 Geological Society of South Africa, Johannesburg, Transvaal.
- 1805 Geological Survey of the South African Republic, Pretoria, Transvaal.
- 1809 Witwatersrand Mining and Metallurgical Review, Johannesburg, Transvaal.
- 1810 Museum d'histoire Naturelle de la Réunion, St. Denis, Réunion.

WEST INDIES.

- 1812 Academia de Ciencias Medicas, Fisicas y Naturales, Habana, Cuba.
- 1815 Institute of Jamaica, Kingston, Jamaica.
- 1818 Prof. R. J. Lechmere Guppy, Port-of-Spain, Trinidad.
- 1821 Victoria Institute, Port-of-Spain, Trinidad.

CENTRAL AMERICA.

- 1824 Departamento Nacional de Estadística, San José, Costa Rica.
- 1827 Instituto Físico-Geográfico Nacional, San José, Costa Rica.
- 1830 Honduras Mining Journal, Dr. R. Fritzgartner, editor, Tegucigalpa, Honduras.
- 1833 J. Crawford, Managua, Nicaragua.
- 1836 Observatorio Astronómico y Meteorológico del Salvador, San Salvador.

SOUTH AMERICA.

ARGENTINA.

- 1829 Departamento de Correos y Telégrafos, Buenos Aires.
- 1842 Departamento Nacional de Minas y Geología, Buenos Aires.
- 1845 Instituto Geográfico Argentino, Buenos Aires.
- 1848 Museo Nacional, Buenos Aires.
- 1851 Sociedad Científica Argentina, Buenos Aires.
- 1854 Academia Nacional de Ciencias, Córdoba.
- 1857 Direction Générale de Statistique de la Province de Buenos Aires, La Plata.
- 1860 Museo de La Plata, La Plata.

BOLIVIA.

- 1864 Oficina Nacional Inmigración, Estadística y Propaganda Geográfica, La Paz.

BRAZIL.

- 1866 Escola de Minas, Ouro Preto, Minas-Geraes.
- 1868 Museu Paraense de História Natural, Para.
- 1869 Bibliotheca Nacional, Rio de Janeiro.
- 1870 Club de Engenharia, Rio de Janeiro.
- 1875 Instituto Histórico, Geográfico e Ethnográfico do Brazil, Rio de Janeiro.
- 1878 Museu Nacional, Rio de Janeiro.
- 1881 Sociedad de Geografía do Rio de Janeiro.
- 1884 Comissão geographica e geologica de São Paulo, São Paulo.
- 1887 Prof. Orville A. Derby, São Paulo.
- 1888 Dr. Eugen Hussak, São Paulo.
- 1890 Museu Paulista, São Paulo.
- 1872 Comissão geographica e geologica de Minas Geraes, S. João d'El Rei.

BRITISH GUIANA.

- 1891 John B. Harrison, Georgetown.

CHILE.

- 1893 Oficina Hidrografica de Chile, Santiago.
1896 Dr. Federico Philippi, Santiago.
1899 Sociedad Cientifica Alemana, Santiago.
1902 Sociedad Nacional de Minería, Santiago
1905 Sociedad Cientifica de Chile, Santiago.

COLOMBIA.

- 1908 Sociedad de Naturalistas Colombianos, Bogota.

PARAGUAY.

- 1911 Oficina general de informaciones y canjes, Asuncion.

PERU.

- 1914 La Escuela de Ingenieros del Peru, Lima.
1917 Sociedad Geografica de Lima, Lima.

URUGUAY.

- 1919 Dr. D. Florentino Felippone, Montevideo.
1920 Museo Nacional, Montevideo.
1921 Oficina Particular de Informaciones, Montevideo.

VENEZUELA.

- 1923 Dr. Adolf Ernst, Caracas.
1926 Museo Nacional, Caracas.
1929 Universidad de Caracas, Caracas.

CHINA.

- 1932 Chinese Scientific and Industrial Magazine, Shanghai.
1935 Zikawei Observatory, Shanghai.

INDIA.

- 1938 Public Works Department, Irrigation Branch, Allahabad.
1941 Royal Asiatic Society (Bombay Branch), Bombay.
1944 Under Secretary to the Government, Bombay.
1947 Asiatic Society of Bengal, Calcutta.
1948 P. N. Bose, Calcutta.
1950 Geological Survey of India, Calcutta.
1953 Thomas H. Holland, Calcutta.
1956 Indian Meteorological Department, Calcutta.
1959 Irrigation Department of the Government of Bengal, Calcutta.
1962 Dr. Fritz Noetling, Calcutta.
1965 Public Works Department, Irrigation Branch, Colombo, Ceylon.
1968 Royal Asiatic Society (Ceylon Branch), Colombo, Ceylon.
1971 Survey of India Department, Trigonometrical Branch Office, Dehra Dun.
1975 P. V. Jagadisa Aiyar, Triplicane, Madras.
1977 Madras Literary Society, Madras.
1980 Public Works Department, Irrigation Branch, Madras.
1983 Prof. Samuel Cooke, Poona.
1986 Thomason College of Civil Engineering, Roorkee.
1974 Public Works Department of Punjab, Irrigation Branch, Simla.
1989 United Service Institution of India, Simla.

JAPAN.

- 1995 Asiatic Society of Japan, Tokio.
- 1998 Chishitsu Kyoku (Geological Survey of Japan), Tokio.
- 2001 Deutsche Gesellschaft für Natur-und Völkerkunde Ost-Asien's, Tokio.
- 2004 Imperial Meteorological Observatory, Tokio.
- 2007 Imperial Mining Bureau, Tokio.
- 2010 Tadatsugu Kochibe, Tokio.
- 2016 Teikoku Daigaku (Imperial University), Tokio.
- 2019 Tokio Geographical Society, Tokio.
- 1992 Prof. Wataru Watanabe, Tokio.

JAVA.

- 2022 Koninklijke Natuurkundige Vereeniging in Nederlandsch-Indie, Batavia.
- 2025 Dr. R. D. M. Verbeek, Weltevreden, Batavia.

PHILIPPINE ISLANDS.

- 2028 Inspeccion general de Minas, Manila.
- 2031 Observatorio Meteorologica, Manila.

AUSTRALIA.

NEW SOUTH WALES.

- 2034 Australasian Association for the Advancement of Science, Sydney.
- 2037 Australian Mining Standard, Sydney.
- 2040 Australian Museum, Sydney.
- 2043 George W. Card, Sydney.
- 2046 Joseph E. Carne, Sydney.
- 2048 W. S. Dun, Sydney.
- 2049 Robert Etheridge, jr., Sydney.
- 2052 Geological Survey, Sydney.
- 2053 John B. Jaquet, Sydney.
- 2055 Linnean Society of New South Wales, Sydney.
- 2058 Prof. Archibald Liversidge, Sydney.
- 2061 New South Wales Government Board of International Exchanges, Sydney.
- 2064 Office of Water Conservation, Department of Mines, Sydney.
- 2067 Edward F. Pittman, Sydney.
- 2070 Royal Society of New South Wales, Sydney.
- 2073 H. C. Russell, Sydney.
- 2074 Sydney Observatory, Sydney.

QUEENSLAND.

- 2076 Geological Survey of Queensland, Brisbane.
- 2079 J. B. Henderson, Brisbane.
- 2082 Robert Logan Jack, Brisbane.
- 2085 Queensland Museum, Brisbane.
- 2087 William H. Rands, Brisbane.
- 2088 Royal Geographical Society of Australasia, Queensland Branch, Brisbane.
- 2090 Clement L. Wragge, Brisbane.

SOUTH AUSTRALIA.

- 2091 Geological Survey of South Australia, Adelaide.
- 2094 Royal Society of South Australia, Adelaide.
- 2097 South Australia School of Mines and Industries, Adelaide.
- 2100 Prof. Ralph Tate, Adelaide.
- 2103 J. J. East, Hackney (near Adelaide).

TASMANIA.

- 2106 Clerk of Parliament, House of Assembly, Hobart Town.
2109 Royal Society of Tasmania, Hobart Town.
2110 Government Geologist, Launceston.

VICTORIA.

- 2112 The Gordon Technical College, Geelong.
2113 Australasian Institute of Mining Engineers, Melbourne.
2115 Department of Mines, Melbourne.
2118 Department of Victorian Water Supply, Melbourne.
2121 Geological Society of Australasia, Melbourne.
2123 F. M. Krausé, Melbourne.
2127 Public Library, Museums, and National Gallery of Victoria, Melbourne.
2130 Royal Society of Victoria, Melbourne.
2133 Victoria Institute of Surveyors, Melbourne.
2136 Stawell Technical College and School of Mines, Stawell.

WESTERN AUSTRALIA.

- 2139 Geological Survey of Western Australia, Perth.
2142 Andrew Gibb Maitland, Perth.

NEW ZEALAND.

- 2144 Henry P. Gordon, Auckland.
2145 Dr. F. W. Hutton, Christchurch.
2146 George H. F. Ulrich, Dunedin.
2147 James Park, Thames.
2148 Colonial Museum and Geological Survey Department, Wellington.
2150 Alexander McKay, Wellington.
2151 The Under Secretary, Mines Department, Wellington.
2154 New Zealand Institute, Wellington.

AUSTRIA-HUNGARY.

- 1867 Dr. Fried. Katzer, Sarajevo, Bosnia.
2157 K. k. Mährische-Gesellschaft zur Beförderung der Landwirthschaft der Natur- und Landeskunde, Brünn, Moravia.
2160 Naturforschender Verein, Brünn, Moravia.
2163 Hungarian Polytechnic School, Budapest.
2166 Magyar Földrajzi Társaság, Budapest.
2169 Magyar Királyi Földtani Intézet, Budapest.
2172 Magyarhoni Földtani Tarsulat, Budapest.
2175 Magyar Királyi Természettudományi Tarsulat, Budapest.
2178 Magyar Tudományok Akademia, Budapest.
2181 Meteorologiai és Földdelejeségi Magyar k. k. intézet, Budapest.
2182 Dr. Julius Pethő, Budapest.
2183 Dr. Ferencz Schafarzik, Budapest.
2184 Természettudományi Füzetek Magyar nemzeti museum, Budapest.
2187 K. k. Franz-Josephs Universitäts Bibliothek, Czernowitz, Bukowina.
2190 Dr. Ferdinand Löwl, Czernowitz, Bukowina.
2193 Dr. Rudolf Scharizer, Czernowitz, Bukowina.
2196 Dr. Cornelius Doelter, Grätz, Styria.
2199 Mineralogisches Institut der Universität Grätz, Grätz, Styria.
2202 Naturwissenschaftlicher Verein für Steiermark, Grätz, Styria.
2205 Karl A. Penecke, Grätz, Styria.

- 2208 Siebenbürgischer Verein für Naturwissenschaften, Hermannstadt, Transylvania.
- 2211 Ungarischer Karpathen-Verein, Igló, Hungary.
- 2214 Ferdinandeum, Innsbruck, Tyrol.
- 2217 Naturhistorisches Landesmuseum von Kärnten, Klagenfurt, Carinthia.
- 2220 Akademija Umiejetno'sci, Krakau, Galicia.
- 2223 Dr. Ladislaus Szajnocha, Krakau, Galicia.
- 2226 Muzeum imienia Dzieduszyckich we Lwowie, Lemberg, Galicia.
- 2228 Prof. Hans Hoesfer, Leoben, Styria.
- 2229 K. k. Berg Akademie, Leoben, Styria.
- 2232 Oesterreichische Zeitschrift für Berg-und Hüttenwesen, Leoben, Styria.
- 2235 Museum Francisco-Carolinum, Linz, Upper Austria.
- 2238 Dr. Friedrich Becke, Prag, Bohemia.
- 2241 Ceske Akademie Cisare Frantiska Josefa, Prag, Bohemia.
- 2244 Comité für Naturwissenschaftliche Landesdurchforschung, Prag, Bohemia.
- 2247 Deutscher Natur.-medizinischer Verein "Lotos," Prag, Bohemia.
- 2250 Dr. Anton Fritsch, Prag, Bohemia.
- 2253 K. böhmische Gesellschaft der Wissenschaften, Prag, Bohemia.
- 2256 Musée Bohême, Prag, Bohemia.
- 2259 Baron Adelbert von Inkey, Presburg.
- 2261 Dr. J. E. Hibsich, Tetschen a. Elbe.
- 2262 Museo Civico di Storia Naturale, Trieste, Kustenland.
- 2265 K. k. Astronomisch-Meteorologische Observatorium, Trieste, Kustenland.
- 2268 Società Adriatica di Scienze Naturali, Trieste, Kustenland.
- 2271 Società Alpina delle Giulie, Trieste, Kustenland.
- 2274 Anthropologische Gesellschaft in Wien, Wien.
- 2277 Dr. A. Bittner, Wien.
- 2280 Dr. A. Brezina, Wien.
- 2283 Deutscher u. Oesterreichischer Alpen Verein, Wien.
- 2286 Dr. Karl Fritsch, Wien.
- 2289 Dr. Theodor Fuchs, Wien.
- 2292 Geographisches Institut der K. k. universität, Wien.
- 2295 Geologisches Institut der Universität Wien, Wien.
- 2298 Dr. Georg Geyer, Wien.
- 2307 Kaiserliche Akademie der Wissenschaften, Wien.
- 2310 K. k. Geographische Gesellschaft, Wien.
- 2313 K. k. Geologische Reichsanstalt, Wien.
- 2316 K. k. Gradmessungs-Bureau, Wien.
- 2319 K. k. Hydrographisches Central-Bureau, Wien.
- 2322 K. k. Militär-Geographisches Institut, Wien.
- 2325 K. k. Naturhistorisches Hofmuseum, Geologisch-Paleontologische Abth. Wien.
- 2328 K. k. Zoologisch-Botanische Gesellschaft, Wien.
- 2331 Dr. Felix Karrer, Wien.
- 2334 Dr. Edmund von Mojsisovics, Edlen von Mojsvar, Wien.
- 2337 Naturwissenschaftlicher Verein der Universität Wien, Wien.
- 2340 Oesterreichische Gesellschaft für Meteorologie, Wien.
- 2343 Dr. Albrecht Penck, Wien.
- 2346 Dr. E. Reyer, Wien.
- 2352 Section für Naturkunde des Ö. T. C., Wien.
- 2355 Dr. Guido Stache, Wien.
- 2358 Dr. Eduard Suess, Wien.
- 2361 Dr. Emil Tietze, Wien.
- 2364 Dr. Franz Toula, Wien.
- 2367 Dr. Gustav Tschermak, Wien.
- 2369 M. Vacek, Wien.
- 2370 Verein der Geographen an der k. k. Universität, Wien.

- 2373 Verein zur Verbreitung Naturwissenschaftlicher Kenntnisse, Wien.
- 2376 Dr. Franz Wähner, Wien.
- 2379 Wissenschaftlicher Club in Wien, Wien.
- 2382 Dr. Spiridion Brusina, Zagreb (Agram), Croatia.

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BELGIUM.

- 2385 Société Royale de Géographie d'Anvers, Anvers.
- 2388 Académie Royale des Sciences de Belgique, Bruxelles.
- 2391 Bibliothèque de la Commission Centrale de Statistique, Bruxelles.
- 2394 Commission Géologique de Belgique, Bruxelles.
- 2397 Emile Delvaux, Bruxelles.
- 2400 Louis Dollo, Bruxelles.
- 2403 État Indépendant du Congo, Bruxelles.
- 2406 Institut Cartographique Militaire, Bruxelles.
- 2409 Dr. Michel Murlon, Bruxelles.
- 2412 Le Mouvement Géographique, Bruxelles.
- 2415 Musée Royale d'Histoire Naturelle de Belgique, Bruxelles.
- 2418 Élisée Reclus, Bruxelles.
- 2421 Revue de l'Université de Bruxelles, Bruxelles.
- 2424 Aimé Rutot, Bruxelles.
- 2427 Société Belge de Géologie, etc., Bruxelles.
- 2430 Société Entomologique de Belgique, Bruxelles.
- 2433 Société Royale Belge de Géographie, Bruxelles.
- 2436 Société Royale Malacologique de Belgique, Bruxelles.
- 2437 Société Scientifique de Bruxelles, Bruxelles.
- 2439 Université libre de Bruxelles, Bruxelles.
- 2442 Dr. Ernest Van den Broeck, Bruxelles.
- 2444 Prof. C. Malaise, Gembloux.
- 2445 Dr. Xavier Stainier, Gembloux.
- 2448 Comte de Kerchove de Deeckerghem, Ghent.
- 2451 Association des Ingénieurs sortis de l'Ecole de Liège, Liège.
- 2454 Dr. Gustave Dewalque, Liège.
- 2457 Fédération des Sociétés d'Horticulture de Belgique, Liège.
- 2460 Dr. Lucien Louis de Koninck, Liège.
- 2463 Société Géologique de Belgique, Liège.
- 2466 Société Royale des Sciences, Liège.
- 2469 Prof. François de Walque, Louvain.
- 2472 Université Catholique de Louvain, Louvain.
- 2475 Dr. P. J. Van Beneden, Louvain.
- 2478 Société des Ingénieurs sortis de l'École d'Industrie du Hainaut, Mons.
- 2481 Société des Sciences, des Arts et des Lettres du Hainaut, Mons.
- 2484 Alphonse Briart, Morlanwelz.

BULGARIA.

- 2487 Institut Géologique, Sofia.
- 2490 Princely Library, Sofia.

DENMARK.

- 2493 Commission for Ledelsen af de geologiske og geographiske Undersøgelser i Gronland, Copenhagen.
- 2496 Danmarks geologiske Undersøgelse, Copenhagen.
- 2499 Geographiske Selskabet, Copenhagen.
- 2502 Prof. S. M. Jørgensen, Copenhagen.
- 2505 Kongelige Danske Videnskabernes Selskabet, Copenhagen.
- 2508 Kongelige Nordiske Oldskrift Selskabet, Copenhagen.

- 2511 Dr. Christian F. Lütken, Copenhagen.
 2517 K. J. V. Steenstrup, Copenhagen.
 2520 Prof. H. Topsøe, Copenhagen.
 2523 Prof. N. V. Ussing, Copenhagen.

ICELAND.

- 2526 Prof. Th. Thoroddsen, Reykjavik.

FRANCE.

- 2529 Société d'Agriculture, Sciences et Arts d'Agen, Agen.
 2532 Société des Sciences Naturelles, Bourg.
 2535 Académie des Sciences, Agriculture, Arts et Belles-Lettres, Aix-en-Provence.
 2538 Société Scientifique et Littéraire d'Alais, Alais.
 2541 Académie des Sciences, Lettres et Arts d'Amiens, Amiens.
 2544 Société Linnéenne du Nord de la France, Amiens.
 2547 Société des Sciences Historiques et Naturelles de l'Yonne, Auxerre.
 2550 Société Ramond, Bagnères-de-Bigorre.
 4427 Dr. H. J. Johnston-Lavis, Beaulieu.
 2553 Société Académique d'Archéologie, Sciences et Arts du Dépt. de l'Oise, Beauvais.
 2556 Société d'Emulation du Doubs, Besançon.
 2559 Société d'Etude des Sciences Naturelles de Beziers, Beziers.
 2562 Académie Nationale des Sciences, Belles-Lettres et Arts, Bordeaux.
 2565 Club Alpin Français, Bordeaux.
 2571 Société des Sciences Physiques et Naturelles de Bordeaux, Bordeaux.
 2574 Dr. H. Emile Sauvage, Boulogne-sur-mer.
 2577 Ch. Tardy, Bourg-en-Bresse.
 2580 Société Académique de Brest, Brest.
 2583 Société Linnéenne de Normandie, Caen.
 2586 Société des Sciences Naturelles de Saône-et-Loire, Chalon-sur-Saône.
 2589 Société Nationale des Sciences Naturelles et Mathématiques, Cherbourg.
 2592 Société de Borda, Dax.
 2595 Ph. Zürcher, Digne.
 2598 Académie des Sciences, Arts et Belles-Lettres de Dijon, Dijon.
 2601 Société d'Agriculture, Sciences et Arts de Douai, Douai.
 2604 Union Géographique du Nord de la France, Douai.
 2607 Laboratoire de Géologie de la Faculté des Sciences, Grenoble.
 2610 P. Lory, Grenoble.
 2613 Société des Touristes du Dauphiné, Grenoble.
 2616 Académie des Belles-Lettres, Sciences et Arts (Sciences Naturelles), La Rochelle.
 2619 Société d'Horticulture et de Botanique du Havre, Le Havre.
 2622 Société Géologique de Normandie, Le Havre.
 2625 E. Bollaert, Lens.
 2628 Société d'Agriculture, Sciences, Arts et Commerce, Le Puy.
 2631 Dr. Charles Barrois, Lille.
 2634 Prof. Jules Gosselet, Lille.
 2637 Société Géologique du Nord, Lille.
 2640 Société Scientifique du Département du Nord, Lille.
 2643 Académie des Sciences, Belles-Lettres et Arts de Lyon, Lyon.
 2646 Dr. Louis Lortet, Lyon.
 2649 Muséum d'Histoire Naturelle de Lyon, Lyon.
 2652 Observatoire de Lyon, St.-Genis-Laval, près Lyon.
 2655 Société d'Agriculture, Sciences et Industrie de Lyon, Lyon.
 2657 Société d'Anthropologie de Lyon, Lyon.
 2660 Société Linnéenne de Lyon, Lyon.
 2662 Université de Lyon, Lyon.

- 2663 Académie de Mâcon; Société des Arts, Belles-Lettres et d'Agriculture, Mâcon.
2666 Faculté des Sciences, Marseilles.
2669 Dr. A. F. Marion, Marseilles.
2672 M. Philippe Matheron, Marseilles.
2675 Musée d'Histoire Naturelle de Marseilles, Marseilles.
2678 Société de Géographie de Marseilles, Marseilles.
2681 Société d'Horticulture et de Botanique de Marseilles, Marseilles.
2684 Prof. Victor Raulin, Montfaucon d'Argonne.
2687 Académie des Sciences et Lettres de Montpellier, Montpellier.
2690 Paul Cazalis de Fondouce, Montpellier.
2693 Société Languedocienne de Géographie, Montpellier.
2696 Revue Scientifique du Bourbonnais, etc., Moulins.
2699 Académie de Stanislas, Nancy.
2702 Prof. J. Thoulet, Nancy.
2705 Société Académique de Nantes et de la Loire-Inférieure, Nantes.
2708 Société des Sciences Naturelles de l'Ouest de la France, Nantes.
2711 Club Alpin Français, Nice.
2714 Société des Lettres, Sciences et Arts des Alpes-Maritimes, Nice.
2717 Académie de Nîmes, Nîmes.
2720 Société d'Etude des Sciences Naturelles, Nîmes.
2723 Société de Statistique, Sciences et Arts des Deux-Sèvres, Niort.
2726 Société d'Agriculture, Sciences, Belles-Lettres et Arts d'Orléans, Orleans.
2729 Annales des Mines, Paris.
2732 Annales des Ponts et Chaussées, Paris.
2735 Annales des Sciences Géologiques, Paris.
2738 Annales des Sciences Naturelles, Paris.
2741 L'Anthropologie, Paris.
2744 Association Française pour l'Avancement des Sciences, Paris.
2747 Jules Bergeron, Paris.
2750 Prof. Marcel Bertrand, Paris.
2753 Bibliothèque Nationale, Paris.
2756 Dr. Marcellin Boule, Paris.
2762 Bureau des Longitudes, Paris.
2765 Lucien Cayeux, Paris.
2768 Club Alpin Français, Paris.
2774 Commission Française des Echanges Internationaux, Paris.
2777 Conservatoire National des Arts et Métiers, Paris.
2780 Prof. A. Cornu, Paris.
2783 Maurice Cossmann, Paris.
2786 Service Géographique de l'Armée, Paris.
2792 Direction Générale des Services Hydrographiques, Paris.
2795 Dr. Gustav F. Dollfus, Paris.
2798 A. Duponchel, Paris.
2801 Ecole Nationale des Mines, Paris.
2804 Ecole Polytechnique, Paris.
2807 Faculté des Sciences de Paris, Laboratoire de Géologie, Paris.
2810 Henri Fayol, Paris.
2813 Prof. F. Fouqué, Paris.
2816 Prof. Albert Gaudry, Paris.
2819 Alfred Grandidier, Paris.
2822 Hachette & Cie, Paris.
2825 Institut de France: Académie des Sciences, Paris.
2828 Journal de Conchyliologie, Paris.
2831 Journal des Chemins de Fer, des Mines et des Travaux Publics, Paris.
2834 Laboratoire de Géologie de l'Ecole des Hautes Etudes: à la Sorbonne, Paris.

- 2837 Dr. Alfred Lacroix, Paris.
2840 Prof. A. de Lapparent, Paris.
2843 L. de Launay, Paris.
2845 Édouard David Levat, Paris.
2846 Prof. A. Michel-Lévy, Paris.
2849 M. Emmanuel de Margerie, Paris.
2852 M. E. A. Martel, Paris.
2855 Dr. Stanislas Meunier, Paris.
2858 Prof. Alphonse Milne-Edwards, Paris.
2861 Ministère de l'Agriculture, Paris.
2864 Ministère des Travaux Publics, Paris.
2867 Musée Guimet, Paris.
2870 Muséum d'Histoire Naturelle, Paris.
2873 La Nature, Paris.
2876 Dr. Emile Oustalet, Paris.
2879 M. G. Ramond, Paris.
2882 Dr. Bernard Renault, Paris.
2885 Revue Géographique Internationale, Paris.
2888 Revue Scientifique, Paris.
2891 Emile Riviere, Paris.
2894 Ch. Schlumberger, Paris.
2897 Service de la Carte Géologique de la France, Paris.
2900 Société Chimique de Paris, Paris.
2903 Société d'Anthropologie de Paris, Paris.
2906 Société de Géographie, Paris.
2909 Société de Géographie Commerciale de Paris, Paris.
2912 Société des Ingénieurs Civils, Paris.
2915 Société de Spéléologie, Paris.
2918 Société de Topographie de France, Paris.
2921 Société Entomologique de France, Paris.
2924 Société Française de Minéralogie, Paris.
2927 Société Française de Physique, Paris.
2930 Société Géologique de France, Paris.
2933 Société Météorologique de France, Paris.
2939 Société Zoologique de France, Paris.
2942 Dr. Ed. L. Trouessart, Paris.
2945 René Zeiller, Paris.
2948 Société d'Agricole, Scientifique et Littéraire des Pyrénées-Orientales, Perpignan.
2951 Dr. Victor Lemoine, Reims.
2954 Société d'Etude des Sciences Naturelles, Reims.
2957 Société des Amis des Sciences et Arts, Rochecouart.
2960 Société de Géographie de Rochefort, Rochefort.
2963 Société des Lettres, Sciences et Arts de l'Aveyron, Rodez.
2966 Académie des Sciences, Belles-Lettres et Arts de Rouen, Rouen.
2969 Société des Amis des Sciences Naturelles de Rouen, Rouen.
2972 Albert Falsan, Saint-Cyr-au-Mont-d'Or, près Lyon.
2975 Ecole des Mines, St. Etienne.
2978 Dr. F. Cyrille Grand'Eury, St.-Etienne.
2981 Société de l'Industrie Minérale, St.-Etienne.
2982 P. Stuart-Menteath, St. Jean-de-Luz.
2984 Société d'Agriculture de la Manche, Saint-Lô.
2987 Société des Sciences Historiques et Naturelles, Semur.
2993 Académie des Sciences, Toulouse.
2996 M. Édouard Harlé, Toulouse.
2999 Musée d'Histoire Naturelle, Toulouse.
3002 Société des Sciences Physiques et Naturelles, Toulouse.

- 3005 Société d'Histoire Naturelle de Toulouse, Toulouse.
3008 Société de Géographie, Tours.
3011 Société Académique d'Agriculture, Sciences, etc., de l'Aube, Troyes.
3014 Société d'Agriculture, Sciences et Arts, Valenciennes.

GERMANY.

- 3020 Dr. Eduard Holzapfel, Aachen.
3023 Naturforschende Gesellschaft des Osterlandes, Altenburg.
3026 Annaberg-Buchholzer Verein für Naturkunde, Annaberg, Saxony.
3029 Naturwissenschaftlicher Verein für Schwaben und Neuburg, Augsburg, Bavaria.
3032 Naturforschende Gesellschaft, Bamberg, Bavaria.
3035 Dr. G. Berendt, Berlin.
3038 Botanischer Verein der Provinz Brandenburg, Berlin.
3044 Deutsche Chemische Gesellschaft, Berlin.
3047 Deutsche Entomologische Gesellschaft, Berlin.
3050 Deutsche Geologische Gesellschaft, Berlin.
3053 Deutsche Rundschau, Berlin.
3056 Dr. Adolf Engler, Berlin.
3057 R. Friedländer & Sohn, Berlin.
3059 Gesellschaft für Erdkunde, Berlin.
3062 Gesellschaft Naturforschender Freunde, Berlin.
3065 Hydrographisches Amt des Reichs-Marine-Amtes, Berlin.
3068 Dr. Otto Jaekel, Berlin.
3070 Dr. F. Kaunhoben, Berlin.
3071 Dr. Konrad Keilhack, Berlin.
3073 Dr. Adolf Klautzsch, Berlin.
3074 Dr. C. Klein, Berlin.
3077 Königliche Bibliothek, Berlin.
3080 Königliche Geologische Landes-Anstalt und Bergakademie, Berlin.
3083 Königliches Kriegsministerium: Generalstab, Berlin.
3086 Königlich preussische Akademie der Wissenschaften, Berlin.
3089 Königlich Preussisches Meteorologisches Institut, Berlin.
3092 K. Preussische Sternwarte, Berlin.
3095 Mineralogisch-Petrographisches Institut, Berlin.
3098 Dr. Karl A. Möbius, Berlin.
3101 Naturwissenschaftliche Wochenschrift, Gr. Lichterfelde (P. B.) bei Berlin.
3104 Physikalische Gesellschaft, Berlin.
3107 Baron Ferdinand von Richthofen, Berlin.
3110 Dr. Julius Romberg, Berlin.
3113 Zeitschrift für das Berg-hütten-und Salinen-wesen, Berlin.
3116 Zeitschrift für Praktische Geologie, Berlin-Charlottenburg.
3119 Königlich Preussisches Oberbergamt, Bonn.
3122 Dr. Hugo Laspeyres, Bonn.
3125 Mineralogisches Institut der Universität, Bonn.
3128 Naturhistorischer Verein, Bonn.
3131 Dr. A. Philippson, Bonn.
3132 Prof. Pohl, Bonn.
3134 Prof. Clemens Schlüter, Bonn.
3137 Globus, Braunschweig.
3140 Naturwissenschaftliche Rundschau, Braunschweig.
3143 Verein für Naturwissenschaft, Braunschweig.
3146 Geographische Gesellschaft, Bremen.
3149 Meteorologisches Observatorium der freien Hansestadt Bremen, Bremen.
3152 Naturwissenschaftlicher Verein, Bremen.
3155 Dr. Fritz Frech, Breslau.

- 3158 Königlich Preussisches Oberbergamt, Breslau.
3161 Dr. Carl G. W. Stenzel, Breslau.
3164 Verein für Naturkunde zu Cassel, Cassel.
3167 Physikalisch-Technisch Reichsanstalt, Charlottenburg bei Berlin.
3170 Dr. Otto Herrmann, Chemnitz.
3173 Naturwissenschaftliche Gesellschaft zu Chemnitz, Chemnitz.
3176 Dr. J. T. Sterzel, Chemnitz.
3179 Königliche Bergakademie, Clausthal.
3182 Naturhistorischer Gesellschaft in Colmar, Colmar.
3185 Dr. H. Conwentz, Danzig.
3188 Herr Otto Helm, Danzig.
3191 Naturforschende Gesellschaft, Danzig.
3194 Großherzogliche hessische Geologische Anstalt, Darmstadt.
3197 Verein für Erdkunde und Verwandte Wissenschaften, Darmstadt.
3200 Verein für Geschichte und Naturgeschichte der Baar, Donauessingen.
3203 Prof. Hermann Engelhardt, Dresden.
3206 General Direction der k. Sammlungen für Kunst und Wissenschaft, Dresden.
3209 Gesellschaft für Natur- und Heilkunde, Dresden.
3212 Dr. Ernst Kalkowsky, Dresden.
3218 Naturwissenschaftliche Gesellschaft "Isis," Dresden.
3221 Dr. Oskar Schneider, Dresden.
3224 Dr. Alphons Stübel, Dresden.
3227 Verein für Erdkunde, Dresden.
3230 "Pollichia:" Naturw. Verein der Rheinpfalz, Dürkheim a. d. Haardt.
3233 Naturwissenschaftlicher Verein von Elberfeld und Barmen, Elberfeld.
3236 Naturforschende Gesellschaft, Emden.
3239 Dr. Hans Lenk, Erlangen.
3240 Physikalisch-medicinische Societät, Erlangen.
3242 Neue Zoologische Gesellschaft, Frankfurt-a-M.
3245 Senckenbergische naturforschende Gesellschaft, Frankfurt-a-M.
3248 Verein für Geographie und Statistik, Frankfurt-a-M.
3251 Naturwissenschaftlicher Verein des Regierungs-Bezirks, Frankfurt-a-O.
3254 Anglo-American Club, Freiberg.
3257 Bergmännischer Verein, Freiberg.
3260 Königlich sächsische Bergakademie, Freiberg.
3263 Dr. Th. Richter, Freiberg.
3266 Naturforschende Gesellschaft, Freiburg.
3269 Dr. Gustav Steinmann, Freiburg.
3272 Dr. Reinhard Brauns, Giessen.
3275 Mineralogisches Institut der Universität, Giessen.
3278 Oberhessische Gesellschaft für Natur- und Heilkunde, Giessen.
3281 Naturforschende Gesellschaft, Görlitz.
3284 Dr. A. von Koenen, Göttingen.
3287 Königliche Gesellschaft der Wissenschaften, Göttingen.
3290 Petermanns Mittheilungen, Gotha.
3293 Dr. Emil Cohen, Greifswald.
3296 Geographische Gesellschaft zu Greifswald, Greifswald.
3299 Verein der Freunde der Naturgeschichte in Mecklenburg, Güstrow.
3305 K. L. C. Deutsche Akademie der Naturforscher, Halle-a-S.
3308 Königliches Oberbergamt, Halle-a-S.
3311 Die Natur, Halle-a-S.
3314 Naturforschende Gesellschaft zu Halle, Halle-a-S.
3317 Naturwissenschaftlicher Verein für Sachsen und Thüringen, Halle-a-S.
3320 Verein für Erdkunde, Halle-a-S.
3326 Deutsche Seewarte, Hamburg.
3329 Geographische Gesellschaft, Hamburg.

- 3332 Naturhistorisches Museum, Hamburg.
3335 Naturwissenschaftlicher Verein in Hamburg, Hamburg.
3338 Verein für Naturwissenschaftliche Unterhaltung, Hamburg-Uhlenhorst.
3341 Geographische Gesellschaft, Hannover.
3344 Naturhistorische Gesellschaft, Hannover.
3347 Dr. Carl Struckmann, Hannover.
3350 Dr. Karl Gegenbaur, Heidelberg.
3353 Grossherzogliche Badische Geologische Landesanstalt, Heidelberg.
3356 Naturhistorisch-medizinischer Verein, Heidelberg.
3359 Dr. H. F. Rosenbusch, Heidelberg.
3362 Dr. A. Andreas, Hildesheim.
3365 Geographische Gesellschaft, Jena.
3368 Dr. Ernst Haeckel, Jena.
3371 Medizinisch-naturwissenschaftliche Gesellschaft, Jena.
3374 Dr. Johannes Walther, Jena.
3377 Zoologisches Institut, Jena.
3380 Central Bureau für Meteorologie und Hydrographie, Karlsruhe.
3383 Dr. Hermann Trautschold, Karlsruhe.
3386 Dr. Johannes Lehmann, Kiel.
3389 Ministerial Commission zur wissen. Untersuchung der deutschen Meere, Kiel.
3392 Naturwissenschaftlicher Verein für Schleswig-Holstein, Kiel.
3395 Dr. Alfred Jentsch, Königsberg.
3398 Königsberger Geographische Gesellschaft, Königsberg.
3404 Prof. Otto Mugge, Königsberg.
3407 Physikalisch-ökonomische Gesellschaft, Königsberg.
3410 Annalen der Chemie (Justus Liebig), Leipzig.
3413 Annalen der Physik und Chemie (Poggendorf), Leipzig.
3416 Berg-und Hüttenmannische Zeitung, Leipzig.
3419 F. A. Brockhaus' Verlags Buchhandlung, Leipzig.
3422 Prof. Hermann Credner, Leipzig.
3425 Dr. Johannes Felix, Leipzig.
3428 Dr. Felix Flügel, Leipzig.
3431 Fürstlich Jablonowski'sche Gesellschaft der Wissenschaften, Leipzig.
3434 Geographische Zeitschrift, Leipzig.
3437 Geologische Landesuntersuchung des Königreichs Sachsen, Leipzig.
3440 Dr. Phil. Bruno Giesecke, Leipzig.
3443 Königlich Sächsische Gesellschaft der Wissenschaften, Leipzig.
3446 Museum für Völkerkunde, Leipzig.
3449 Naturforschende Gesellschaft, Leipzig.
3452 Pädagogische Zentralbibliothek (Comenius Stiftung) Leipzig.
3455 Verein für Erdkunde, Leipzig.
3458 Prof. Ferdinand Zirkel, Leipzig.
3461 Verkaufs-Syndicat der Kaliwerke, Leopoldshall bei Stassfurt.
3464 Naturwissenschaftlicher Verein, Lüneberg.
3467 Verein für Naturkunde, Mannheim.
3470 Gesellschaft zur Beförderung der Gesamten Naturwissenschaften, Marburg.
3473 Dr. Emanuel Kayser, Marburg.
3476 Museum Ludwig Salvator, Meissen.
3479 Académie de Metz, Metz.
3482 Verein für Erdkunde, Metz.
3357 Dr. Alfred Osann, Mülhausen.
3485 Prof. A. von Baeyer, München.
3488 Dr. Alfred Bergest, München.
3491 Geographische Gesellschaft, München.
3494 Prof. P. Groth, München.
3497 K. Bayerische Oberbergamt, München.

- 3500 Königlich Baierische Akademie der Wissenschaften, München.
- 3503 K. Baierische Commission der Europäischen Gradmessung, München.
- 3506 Münchener Anthropologische Gesellschaft, München.
- 3512 Dr. Carl A. Zittel, München.
- 3515 Mineralogisch-palaeontologisches Museum der Königl. Akademie, Münster.
- 3518 Naturhistorische Gesellschaft, Nürnberg.
- 3521 Offenbacher Verein für Naturkunde, Offenbach-a-M.
- 3524 Naturwissenschaftlicher Verein, Osnabrück.
- 3527 Naturhistorischer Verein, Passau.
- 3530 Dr. Erich Geobeler, Potsdam.
- 3533 Prof. Robert Helmert, Potsdam.
- 3536 Königlich Geodätisches Institut, Potsdam.
- 3539 Naturwissenschaftlicher Verein in Regensburg, Regensburg.
- 3542 Dr. E. Geinitz, Rostock.
- 3545 Grossherzoglich Mecklenburgische Geologische Landesanstalt, Rostock.
- 3547 Dr. W. Reiss, Schloss Könitz i. Thüringen.
- 3548 Dr. E. W. Benecke, Strassburg.
- 3551 Dr. H. Bücking, Strassburg.
- 3554 Commission für die geologische Landes-Untersuchung von Elsass-Lothringen, Strassburg.
- 3557 Dr. Georg Gerland, Strassburg.
- 3560 Kaiserliches Universitäts- und Landesbibliothek, Strassburg.
- 3563 Société des Sciences, Agriculture et Arts de la Basse-Alsace, Strassburg.
- 3566 Dr. Alexander Tornquist, Strassburg.
- 3569 K. Württembergische Commission für die Europäische gradmessung, Stuttgart.
- 3572 K. Württembergisches Statistisches Landesamt, Stuttgart.
- 3575 Neues Jahrbuch für Mineralogie, Stuttgart.
- 3578 Verein für Vaterländische Naturkunde in Württemberg, Stuttgart.
- 3581 Heinrich Grebe, Trier.
- 3401 Dr. Ernst Koken, Tübingen.
- 3584 Dr. E. A. Wülfig, Tübingen.
- 3587 Geographisches Institut, Weimar.
- 3590 Nassauischer Verein für Naturkunde, Wiesbaden.
- 3593 Verein für Naturkunde, Zwickau.

GREAT BRITAIN.

ENGLAND.

- 3596 Bath Natural History and Antiquarian Field Club, Bath.
- 3602 Birmingham Natural History and Microscopical Society, Birmingham.
- 3605 Prof. Chas. Lapworth, Birmingham.
- 3608 Free Public Library, Bootle, near Liverpool.
- 3611 Free Library, Bradford.
- 3614 Brighton and Sussex Natural History Society, Brighton.
- 3617 Miss Agnes Crane, Brighton.
- 3620 Bristol Naturalists' Society, Bristol.
- 3623 Dr. Henry Clifton Sorby, Broomfield.
- 3626 William Theobald, Esq., Budleigh-Salterton.
- 3629 The Mining Association and Institute of Cornwall, Camborne.
- 3632 Cambridge Philosophical Society, Cambridge.
- 3635 Prof. George H. Darwin, Cambridge.
- 3638 Rev. Osmond Fisher, Cambridge.
- 3641 Prof. Alfred Harker, Cambridge.
- 3644 Prof. Thomas McKenny Hughes, Cambridge.
- 3647 John Edward Marr, Esq., Cambridge.

- 3650 Mineralogical Society of Great Britain and Ireland, Cambridge.
- 3653 University Library, Cambridge.
- 3659 Public Library, Museum, and School of Art, Carlisle.
- 3660 Charles O. Trechmann, Castle Eden, Co. Durham.
- 3662 Royal Engineers' Institute, Chatham.
- 3665 Edward Wethered, Esq., Cheltenham.
- 3668 Chester Society of Natural Science and Literature, Chester.
- 3671 Chesterfield and Midland Counties Institution of Engineers, Chesterfield.
- 3674 Dr. George Jennings Hinde, Croydon.
- 3677 William Whitaker, Esq., Croydon.
- 3680 Wiltshire Archaeological and Natural History Society, Devizes.
- 3683 Dudley and Midland Geological and Scientific Society and Field Club, Dudley.
- 3686 Royal Cornwall Polytechnic Society, Falmouth.
- 3689 Cotteswold Naturalists' Field Club, Gloucester.
- 3692 Richard Lydekker, Esq., Harpenden, Herts.
- 3694 Hull Geological Society, Hull.
- 3695 Percy F. Kendall, Esq., Leeds.
- 3698 Leeds Geological Association, Leeds.
- 3701 Leeds Philosophical and Literary Society, Leeds.
- 3704 Yorkshire College of Science, Leeds.
- 3707 Leicester Literary and Philosophical Society, Leicester.
- 3710 Discovery, Liverpool.
- 3713 Literary and Philosophical Society of Liverpool, Liverpool.
- 3716 Liverpool Geographical Society, Liverpool.
- 3719 Liverpool Geological Association, Liverpool.
- 3722 Liverpool Geological Society, Liverpool.
- 3725 Prof. G. H. Morton, Liverpool.
- 3728 T. Mellard Reade, Esq., Liverpool.
- 3731 University College, Liverpool.
- 3734 Academy, London.
- 3737 Annals and Magazine of Natural History, London.
- 3740 Anthropological Institute of Great Britain and Ireland, London.
- 3743 George Barrow, Esq., London.
- 3746 Hilary Bauerman, Esq., London.
- 3749 Rev. J. F. Blake, London.
- 3752 Prof. T. G. Bonney, London.
- 3755 Bookseller, London.
- 3758 British Association for the Advancement of Science, London.
- 3761 British Museum (General Library), London.
- 3764 British Museum (Natural History), London.
- 3767 John Allen Brown, London.
- 3770 George Isaac Bryant, London.
- 3773 William Carruthers, London.
- 3776 Chemical News, London.
- 3779 Chemical Society, London.
- 3782 Colliery Guardian and Journal of the Coal and Iron Trades, London.
- 3785 Samuel Herbert Cox, Esq., London.
- 3788 Sir W. Crookes, London.
- 3791 J. R. Dakyns, London.
- 3794 Dulwich College Science Society, London.
- 3797 Engineering, London.
- 3800 Engineering Review, London.
- 3803 Entomological Society of London, London.
- 3806 Dr. Robert Etheridge, London.
- 3809 Dr. Lazarus Fletcher, London.
- 3815 Chas. Fox-Strangways, Esq., London.

- 3818 Sir Archibald Geikie, London.
- 3821 Geological Magazine, London.
- 3821 Geological Society of London, London.
- 3827 Geological Survey of the United Kingdom, London.
- 3830 Geologists' Association, London.
- 3833 John Walter Gregory, Esq., London.
- 3836 Guildhall Library, London.
- 3839 George F. Harris, London.
- 3842 Sir Henry H. Howorth, London.
- 3845 Industries and Iron, London.
- 3848 Institution of Civil Engineers, London.
- 3851 Institution of Mechanical Engineers, London.
- 3854 Iron and Steel Institute, London.
- 3857 Prof. Thomas Rupert Jones, London.
- 3860 Prof. John Wesley Judd, London.
- 3863 A. J. Jukes-Brown, Esq., London.
- 3866 G. W. Lamplugh, London.
- 3869 Linnean Society, London.
- 3872 James Logan Lobley, Esq., London.
- 4022 London Library, London.
- 3875 Joseph Lucas, London.
- 4241 Dr. J. C. Forsyth, Major, London.
- 3878 The Mining Journal, London.
- 3881 Nature, London.
- 3884 Edwin Tulley Newton, Esq., London.
- 3887 Patent Office Library, London.
- 3890 Physical Society of London, London.
- 3893 Miss Catherine A. Raisin, London.
- 3896 Alexander Ramsey, Esq., London.
- 3899 Clement Reid, Esq., London.
- 1182 Charles M. Bolker, London.
- 3902 Royal Geographical Society of London, London.
- 3905 Royal Institution of Great Britain, London.
- 3908 Royal Meteorological Society, London.
- 3914 Royal Society of London, London.
- 3917 Royal United Service Institution, London.
- 3923 Frank Rutley, Esq., London.
- 3926 Harry Govier Seeley, London.
- 3929 Society of Engineers, London.
- 3932 South Kensington Museum (Educational Library), London.
- 3935 J. J. H. Teall, West Dulwich, London.
- 3938 Victoria Institute, London.
- 3941 W. W. Watts, Esq., London.
- 3944 William Wesley & Son, London.
- 3947 Dr. Henry Woodward, London.
- 3950 Librarian Zoological Society of London, London.
- 3953 John Ward, Longton.
- 3956 Zoologist, Lower Addiscombe, Surrey.
- 3959 Herbert Bolton, Manchester.
- 3962 Prof. W. Boyd Dawkins, Manchester.
- 3965 Bernard Hobson, Manchester.
- 3968 Manchester Geographical Society, Manchester.
- 3971 Manchester Geological Society, Manchester.
- 3974 Manchester Literary and Philosophical Society, Manchester.
- 3977 Owens College, Manchester.
- 3980 Marlborough College Natural History Society, Marlborough.

- 3983 Yorkshire Geological and Polytechnic Society, Hopton, Mirfield.
3986 North Staffordshire Naturalists' Field Club, Newcastle, Staffordshire.
3989 Durham College of Science, Newcastle-on-Tyne.
3992 Prof. George A. Lebour, Newcastle-on-Tyne.
3995 Prof. Henry Louis, Newcastle-on-Tyne.
3998 Natural History Society of Northumberland, etc., Newcastle-on-Tyne.
4001 North of England Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne.
4004 Prof. John Milne, Newport, Isle of Wight.
4007 Northamptonshire Natural History Society and Field Club, Northampton.
4010 Norfolk and Norwich Naturalists' Society, Norwich.
4013 Oldham Free Reference Library, Art Gallery, and Museum, Oldham.
4015 A. C. Nicholson, Oswestry.
4016 Bodleian Library, Oxford.
4019 Radcliffe Scientific Library, Oxford.
4112 Prof. W. J. Sollas, Oxford.
4025 Penzance Natural History and Antiquarian Society, Penzance.
4028 Royal Geological Society of Cornwall, Penzance.
4031 Devonshire Association for the Advancement of Science, etc., Plymouth.
4034 Plymouth Institution and Devon and Cornwall Natural History Society, Plymouth.
4037 Science and Art and Technical Schools, Plymouth.
4040 Isle of Man Natural History and Antiquarian Society, Ramsey, Isle of Man.
4043 Free Public Library and Museum, Reading.
4046 Dr. Edward Frankland, Reigate.
4049 Rugby School Natural History Society, Rugby.
4052 Hartley Institution, Southampton.
4055 Ordnance Trigonometrical Survey of Great Britain and Ireland, Southampton.
4058 Free Library and Museum, Stoke-on-Trent, Staffordshire.
4061 Sir Joseph Dalton Hooker, Sunningdale, Berks.
4064 Prof. Nevil Story Maskelyne, Swindon, Wiltshire.
4067 Royal Institution of Cornwall, Truro.
4070 Herts Natural History Society and Field Club "Herga," Watford, Herts.
4073 Wellington College Natural Science Society, Wellington College Station, S. E. R.
4076 Wigan Mining and Mechanical School, Wigan.
4079 Yorkshire Philosophical Society, York.

IRELAND.

- 4082 Belfast Naturalists' Field Club, Belfast.
4085 Belfast Natural History and Philosophical Society, Belfast
4088 Queen's College, Cork.
4091 Prof. G. A. J. Cole, Dublin.
4093 Geological Survey of Ireland, Dublin.
4100 National Library of Ireland, Dublin.
4103 Royal Dublin Society, Dublin.
4106 Royal Irish Academy, Dublin.
4109 Royal Society of Antiquaries of Ireland, Dublin.
4115 Queen's College, Galway.
4097 George H. Kinahan, Woodlands, Fairview, County Dublin

SCOTLAND.

- 4118 Natural History Society, Aberdeen.
4124 University Library, Aberdeen.
4127 University College, Dundee.
4130 Advocates' Library, Edinburgh.

- 4133 Botanical Society, Edinburgh.
- 4136 Edinburgh Geological Society, Edinburgh.
- 4139 Dr. James Geikie, Edinburgh.
- 4142 Geological Survey of Scotland, Edinburgh.
- 4145 William Gunn, Esq., Edinburgh.
- 4148 Highland and Agricultural Society of Scotland, Edinburgh.
- 4151 John Murray, Edinburgh.
- 4154 Royal Physical Society, Edinburgh.
- 4457 Royal Scottish Geographical Society, Edinburgh.
- 4160 Royal Society of Edinburgh, Edinburgh.
- 4163 Library of the University of Edinburgh, Edinburgh.
- 4166 Geological Society, Glasgow.
- 4169 Glasgow University Library, Glasgow.
- 4172 Lord Kelvin, Glasgow.
- 4175 Natural History Society of Glasgow, Glasgow.
- 4178 Philosophical Society, Glasgow.
- 4181 Mining Institute of Scotland, Staneacre, Hamilton.
- 4184 Berwickshire Naturalists' Club, Kelso.
- 4187 University Library, St. Andrews.
- 4190 Robert Kidston, Stirling.

WALES.

- 4192 Thomas Winter, Bangor.
- 4193 Cardiff Naturalists' Society, Cardiff.
- 4199 South Wales Institute of Engineers, Cardiff.
- 4195 University College of South Wales and Monmouthshire, Cardiff.
- 4196 Clement Le Neve Foster, Llandudno.
- 4202 Swansea District Society of Mining and Metallurgical Industries, Swansea.

GREECE.

- 4205 National Library of the Greeks, Athens.

ITALY.

- 4208 Accademia di Scienze, Lettere e Arti dei Zelanti e pp. dello studio, Acireale.
- 4214 R. Ateneo di Scienze, Lettere ed Arti di Bergamo, Bergamo.
- 4217 Dr. Giovanni Capellini, Bologna.
- 4220 R. Accademia delle Scienze dell' Istituto di Bologna, Bologna.
- 4223 Rivista Italiana di Paleontologia, Bologna.
- 4226 Ateneo di Scienze, Lettere ed Arti, Brescia.
- 4228 Ing. Domenico Zaccagna, Carrara.
- 4229 Accademia Gioenia di Scienze Naturali, Catania, Sicily.
- 4232 R. Osservatorio di Catania ed Etna, Catania, Sicily.
- 4235 Cav. Ing. Celso Capacci, Firenze.
- 4238 Dr. Enrico H. Giglioli, Firenze.
- 4244 Museo di Geologia e Paleontologia del R. Istituto di Studi Superiori, Firenze.
- 4247 Societa Entomologica Italiana, Firenze.
- 4250 Prof. Carlo de Stefani, Firenze.
- 4253 Prof. Arturo R. Issel, Genova.
- 4256 Museo Civico di Storia Naturale, Genova.
- 4259 Sig. Stefano Traverso, Genova.
- 4262 Prof. Giuseppe Scarabelli, Imola.
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 4298 Società Reale di Napoli: Reale Accademia delle Scienze Fisiche e Matematiche, Napoli.
 4301 Stazione Zoologica, Napoli.
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 4313 *Annales de Géologie et de Paléontologie* (Gregorio), Palermo, Sicily.
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 4319 R. Accademia di Scienze, Lettere e Belle Arti, Palermo, Sicily.
 4322 *Bullettino di Paleontologia Italiana*, Parma.
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 4388 Società Geologica Italiana, Rome.
 4391 Società Italiana delle Scienze (detta dei XL), Rome.
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 4397 Club Alpino Italiano (Sezione di Torino), Torino.
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 4415 *Neptunia*, Venezia.
 4418 Reale Istituto di Scienze, Lettere ed Arti, Venezia.
 4421 Accademia d'Agricoltura Commercio ed Arti, Verona.
 4424 Accademia Olimpica, Vicenza.

NETHERLANDS.

- 4430 Koninklijke Akademie van Wetenschappen, Amsterdam.
- 4433 Kon. Nederlandsch Aardrykskundig Genootschap, Amsterdam.
- 4436 Koninklijk Zoologisch Genootschap "Natura Artis Magistra," Amsterdam.
- 4439 Minister van Kolonien, Amsterdam.
- 4442 Bibliothèque de L'Ecole Polytechnique, Delft.
- 4445 Commission Géodésique Néerlandaise, Delft.
- 4448 Koninklijk Instituut van Ingenieurs, 's Gravenhage.
- 4451 Koninklijk Instituut voor de Taal-, Land- en Volkenkunde, 's Gravenhage.
- 4454 Natuurkundig Genootschap, Groningen.
- 4457 Hollandsche Maatschappij van Wetenschappen, Haarlem.
- 4460 Teyler's Genootschap: Teyler's Museum, Haarlem.
- 4463 Nederlandsche Dierkundige Vereeniging, Helder.
- 4466 Provinciaal Genootschap van Kunsten en Wetenschappen in Noord-Brabant, 's Hertogenbosch.
- 4469 Academia Lugduno-Batava, Leiden.
- 4472 Geologisch Reichs-Museum, Leiden.
- 4475 Dr. K. Martin, Leiden.
- 4478 Nederlandsche Botanische Vereeniging, Leiden.
- 4481 Bataafsch Genootschap van Proefondervindelijke Wijsbegeerte Beurs, Rotterdam.
- 4484 Koninklijk Nederlandsch Meteorologisch Instituut, Utrecht.
- 4487 Dr. J. Loricé, Utrecht.
- 4490 Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen, Utrecht.
- 4493 Bibliotheek der Universiteit te Utrecht, Utrecht.
- 4496 Prof. C. E. Arthur Wichmann, Utrecht.
- 4499 Institut Grand-ducal de Luxembourg, Section des Sciences Naturelles et Mathématiques, Luxembourg.

NORWAY.

- 4502 Bergens Museum, Bergen.
- 4505 Naturen, Bergen.
- 4511 Prof. W. C. Brögger, Christiania.
- 4514 Kongelige Norske Universitet, Christiania.
- 4517 Metallurgical Laboratory of the University, Christiania.
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- 4538 Dr. Hans Reusch, Christiania.
- 4541 Aksel S. Steen, Christiania.
- 4544 Videnskabs Selskabet i Christiania, Christiania.
- 4547 Tromsø Museum, Tromsø.
- 4550 Kongelige Norske Videnskabers Selskabet, Trondhjem.
- 4553 Den Tekniske Laereanstalt, Trondhjem.

PORTUGAL.

- 4556 Academia Real das Sciencias, Lisboa.
- 4559 Dr. Joao Carlos de Brito Capello, Lisboa.
- 4562 Paul Choffat, Lisboa.
- 4568 Comissão dos Trabalhos Geologicos, Lisboa.
- 4571 Direcção Geral dos Trabalhos Geodesicos, Lisboa.

- 4574 *Revue du Portugal et de ses Colonies*, Lisboa.
 4577 *Sociedade de Geographia de Lisboa*, Lisboa.
 4580 *Annaes de Sciencias Naturaes*, Porto.
 4583 *Portugalia*, Porto.

ROUMANIA.

- 4585 *Directiunea Biuroului Geologicu*, Bucharest.
 4586 *Math. M. Draghicianu*, Bucharest.
 4588 *Societatea Geografica Romina*, Bucharest.
 4589 *Prof. Gregoriu Stefanescu*, Bucharest.
 4592 *Commission Européenne du Danube*, Galatz, Moldavia.

RUSSIA.

- 4595 *Dorpater Naturforscher Gesellschaft*, Dorpat.
 4598 *Dr. Phil. François Loewinson-Lessing*, Dorpat.
 4601 *Mineralogisches Museum*, Dorpat.
 4604 *Société Ouralienne des Sciences Naturelles*, Ekaterinburg.
 4607 *Finlands Geologiska Undersökning*, Helsingfors, Finland.
 4610 *Finska Vetenskaps Societet*, Helsingfors, Finland.
 4613 *J. J. Söderholm*, Helsingfors, Finland.
 4616 *Societas pro Fauna et Flora Fennica*, Helsingfors, Finland.
 4619 *Société de Géographie de Finlande*, Helsingfors, Finland.
 4622 *K. Russische Geographische Gesellschaft*, Irkutsk, Siberia.
 4625 *Naturhistorische Gesellschaft der k. Russischen Universität Kazan*, Kazan.
 4628 *K. Universität Kharkov*, Kharkov.
 4631 *Naturhistorische Gesellschaft*, Kiew.
 4634 *Prof. Paul Venukoff*, Kiew.
 4637 *Cabinet de Géographie de l'Université de Moscou*, Moscow.
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 4712 *Naturhistorische Gesellschaft der Kaiserliche Universität St. Petersburg*, St. Petersburg.
 4718 *Russkoe Fiziko-Chimitcheskoe Obschestvo pri St.-Petersburgskom Universitete*, St. Petersburg.

- 4721 Section Géologique du Cabinet de sa Majesté (Ministère de la Maison de l'Empereur), St. Petersburg.
 4724 Section Topographique de l'État Major, St. Petersburg.
 4709 Société Impériale de minéralogique, St. Petersburg.
 4730 Col. B. Witkowski, St. Petersburg.
 4733 Administration des Mines du Caucase, Tiflis.
 4736 K. Russische Geographische Gesellschaft, Tiflis.
 4739 K. Russische Geographische Gesellschaft, Vilna.
 4742 Annuaire Géologique et Minéralogique de la Russie, Novo-Alexandria.

SERVIA.

- 4745 Annales Géologiques de la Péninsule Balkanique, Belgrade.

SPAIN.

- 4748 Asociación de Ingenieros Industriales de Barcelona, Barcelona.
 4751 André de Llauro, Barcelona.
 4754 Real Academia de Ciencias y Artes, Barcelona.
 4757 Academia Nacional de Ciencias Exactas, Cordova.
 4759 Ramon Adan de Yarza, Lequicio (Vizcaya).
 4760 Federico de Botella y de Hornos, Madrid.
 4763 Comision del Mapa Geologico de España, Madrid.
 4766 Instituto Geografico y Estadistico, Madrid.
 4768 Junta Superior Facultativa de Minería, Madrid.
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 4672 Real Academia de Ciencias de Madrid, Madrid.
 4775 Revista Minera, Metalurgica y de Ingenieria, Madrid.
 4778 Sociedad Española de Historia Natural, Madrid.
 4781 Sociedad Geografica de Madrid, Madrid.
 4784 Prof. Salvador Calderon, Sevilla.

SWEDEN.

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 4793 Kongliga Universitetet, Lund.
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 4799 Dr. Sv. Leonhard Törnquist, Lund.
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 4808 Edvard Erdmann, Stockholm.
 4811 Dr. Gerard de Geer, Stockholm.
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 4817 Geologiska Byrån, Stockholm.
 4820 Geologiska Foreningen, Stockholm.
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 4826 Kongliga Svenska Vetenskaps Akademien, Stockholm.
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 4853 Kongliga Vetenskaps Societetet, Upsala.
 4856 Rutger Sernander, Upsala.

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- 4859 Aargauische Naturforschende Gesellschaft, Aarau.
- 4862 Die Mittelschweizerische Geographisch-Commercielle Gesellschaft, Aarau.
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- 4904 Société Jurassienne d'Emulation, Delémont.
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- 4934 Société de Physique et d'Histoire Naturelle, Genève.
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- 4943 Prof. Eugène Renevier, Lausanne.
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- 4955 Société des Sciences Naturelles, Neuchâtel.
- 4958 Société Neuchâteloise de Géographie, Neuchâtel.
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- 4970 Antiquarische Gesellschaft, Zürich.
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- 4983 Naturforschende Gesellschaft, Zürich.
- 4985 Schweizerische Meteorologische Central-Anstalt, Zürich.
- 4727 Dr. Heinrich Wild, Zürich.

TURKEY.

- 4988 Observatoire Impérial de Constantinople, Constantinople.
- 4991 Robert College, Constantinople.

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- 6 State and Supreme Court Library, Montgomery.
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- 21 Mechanics' Library, San Francisco.
- 22 Sutro Library, San Francisco.
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- 30 State School of Mines, Golden.

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- 35 American Journal of Science, New Haven.
- 36 Public Library, New Haven.
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- 39 Silas Bronson Library, Waterbury.

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- 41 Wilmington Institute Free Library, Wilmington.

DISTRICT OF COLUMBIA.

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- 43 Catholic University of America, Washington.
- 44 Chief of Engineers, U. S. A., Washington.
- 45 Columbian University, Washington.
- 46 Cosmos Club, Washington.
- 47 Department of Agriculture, Washington.
- 48 Department of State, Washington.
- 49 General Land Office, Washington.
- 50 Georgetown University, Washington.
- 51 Hydrographic Office, Navy Department, Washington.
- 52 Library of Congress, Washington.
- 53 Metropolitan Club, Washington.
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- 55 Topographer of the Post-Office Department, Washington.
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- 58 U. S. National Museum, Washington.
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- 60 Weather Bureau, Washington.

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- 69 University of Idaho, Moscow.

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- 77 Western Society of Engineers, Chicago.
- 78 Gail Borden Public Library, Elgin.
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- 80 Public Library, Peoria.
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- 82 Illinois State Library, Springfield.
- 83 University of Illinois, Urbana.

INDIANA.

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- 87 De Pauw University, Greencastle.
- 88 Department of Geology and Natural History, Indianapolis.
- 89 Public Library, Indianapolis.
- 90 State Library, Indianapolis.
- 91 Public Library, Lafayette.
- 92 Public Library, Terre Haute.

IOWA.

- 93 Public Library, Burlington.
- 94 Public Library, Council Bluffs.
- 95 Davenport Academy of Natural Sciences, Davenport.
- 96 Geological Survey of Iowa, Des Moines.
- 97 Iowa State Library, Des Moines.
- 98 Young Men's Library Association, Dubuque.
- 99 Iowa College, Grinnell.
- 100 State University of Iowa Library, Iowa City.
- 101 Tabor College, Tabor.

KANSAS.

- 102 University of Kansas, Lawrence.
- 103 Kansas State Library, Manhattan.
- 104 State Agricultural College Library, Manhattan.
- 105 Kansas State Historical Society, State House, Topeka.

KENTUCKY.

- 106 Kentucky State Library, Frankfort.
- 107 Kentucky University, Lexington.
- 108 State Geological Department, State College, Lexington.
- 109 Polytechnic Society of Kentucky, Louisville.

LOUISIANA.

- 110 Louisiana State University and A. & M. College, Baton Rouge.
- 111 Fisk Free and Public Library, New Orleans.
- 112 Howard Memorial Library, New Orleans.
- 113 State Library of Louisiana, New Orleans.

MAINE.

- 114 Maine State Library, Augusta.
- 115 Public Library, Bangor.

- 116 Bowdoin College, Brunswick.
- 117 Maine State College, Orono.
- 118 Public Library, Portland.
- 119 Colby University, Waterville.

MARYLAND.

- 120 Maryland State Library, Annapolis.
- 121 United States Naval Academy, Annapolis.
- 122 Enoch Pratt Free Library, Baltimore.
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- 124 Johns Hopkins University, Baltimore.
- 125 Peabody Institute Library, Baltimore.
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- 128 Appalachian Mountain Club, Boston.
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- 132 Massachusetts Institute of Technology, Boston.
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- 135 Harvard University, Cambridge.
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- 139 Free Public Library, Lawrence.
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- 141 Free Public Library, New Bedford.
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- 143 Essex Institute, Salem.
- 144 City Library Association, Springfield.
- 145 Taunton Public Library, Taunton.
- 146 Tufts College Library, Tufts College.
- 147 Wellesley College Library, Wellesley.
- 148 Free Public Library, Worcester.

MICHIGAN.

- 149 University of Michigan, Ann Arbor.
- 150 Public Library, Detroit.
- 151 Public School Library, Grand Rapids.
- 152 Geological Survey of Michigan, Houghton.
- 153 Michigan State Library, Lansing.
- 154 Olivet College, Olivet.

MINNESOTA.

- 155 Public Library, Duluth.
- 156 Geological and Natural History Survey of Minnesota, Minneapolis.
- 157 Public Library, Minneapolis.
- 158 State University of Minnesota, Minneapolis.
- 159 Minnesota Historical Society, St. Paul.
- 160 Public Library, St. Paul.

MISSISSIPPI.

- 161 Agricultural and Mechanical College of Mississippi, Agricultural College.
- 162 Mississippi State Library, Jackson.
- 163 University of Mississippi, University P. O.

MISSOURI.

- 164 University of the State of Missouri, Columbia.
- 165 Geological Survey of Missouri, Jefferson City.
- 166 Missouri State Library, Jefferson City.
- 167 Public Library, Kansas City.
- 168 Free Public Library, St. Joseph.
- 169 Academy of Science of St. Louis, St. Louis.
- 170 Mercantile Library, St. Louis.
- 171 Mississippi River Commission, St. Louis.
- 172 Missouri River Commission, St. Louis.
- 173 Public Library, St. Louis.
- 174 St. Louis Engineer Club, St. Louis.
- 175 St. Louis University, St. Louis.
- 176 Drury College Library, Springfield.

MONTANA.

- 177 College of Agriculture and Mechanic Arts, Bozeman.
- 178 Free Public Library, Butte.
- 179 Public Library, Helena.

NEBRASKA.

- 180 State Library, Lincoln.
- 181 University of Nebraska, Lincoln.
- 182 Public Library, Omaha.

NEVADA.

- 183 Nevada State Library, Carson City.

NEW HAMPSHIRE.

- 184 New Hampshire State Library, Concord.
- 185 Dartmouth College, Hanover.
- 186 Manchester City Library, Manchester.

NEW JERSEY.

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- 189 Free Public Library, Jersey City.
- 190 Free Public Library, Newark.
- 191 Rutgers College, New Brunswick.
- 192 Free Public Library, Paterson.
- 193 Princeton University, Princeton.
- 194 Geological Survey of New Jersey, Trenton.
- 195 New Jersey State Library, Trenton.

NEW MEXICO.

- 196 Territorial Library, Santa Fe.

NEW YORK.

- 197 Geological Survey of New York, Albany.
- 198 New York State Library, Albany.
- 199 Davenport Library, Bath on Hudson.
- 200 Brooklyn Institute, Brooklyn.
- 201 Brooklyn Library, Brooklyn.

- 202 Pratt Institute Free Library, Brooklyn.
- 203 Buffalo Library, Buffalo.
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- 205 Hobart College, Gen. va.
- 206 Cornell University Library, Ithaca.
- 207 American Book Company, New York City.
- 208 American Engineer and Railroad Journal, New York City.
- 209 American Geographical Society, New York City.
- 210 American Museum of Natural History, New York City.
- 211 American Society of Civil Engineers, New York City.
- 212 Columbia University Library, New York City.
- 213 Cooper Union, New York City.
- 214 Free Circulating Library of Mechanics and Tradesmen, New York City.
- 215 Mercantile Library Association, New York City.
- 216 New York Historical Society, New York City.
- 217 New York Public Library, New York City.
- 218 New York University, New York City.
- 219 New York Yacht Club, New York City.
- 220 Science, New York City.
- 221 Vassar College, Poughkeepsie.
- 222 University of Rochester, Rochester.
- 223 Union College, Schenectady.
- 224 Syracuse University, Syracuse.
- 225 Young Men's Association, Troy.
- 226 City Library, Utica.
- 227 United States Military Academy, West Point.

NORTH CAROLINA.

- 228 University of North Carolina, Chapel Hill.
- 229 Geological Survey of North Carolina, Raleigh.
- 230 North Carolina State Library, Raleigh.
- 231 Wake Forest College, Wake Forest.

NORTH DAKOTA.

- 232 North Dakota Agricultural College, Bismarck.
- 233 State Library, Bismarck.
- 234 University of North Dakota, University P. O.

OHIO.

- 235 Public Library, Akron.
- 236 Ohio University, Athens.
- 237 Cincinnati Public Library, Cincinnati.
- 238 Case Library, Cleveland.
- 239 Public Library, Cleveland.
- 240 Western Reserve University, Cleveland.
- 241 Ohio Geological Survey, Columbus.
- 242 Ohio State Library, Columbus.
- 243 Public School Library, Columbus.
- 244 Public Library, Dayton.
- 245 Ohio Wesleyan University, Delaware.
- 246 Kenyon College, Gambier.
- 247 Marietta College Library, Marietta.
- 248 Oberlin College Library, Oberlin.
- 249 Toledo Public Library, Toledo.
- 250 University of Wooster, Wooster.

OREGON.

- 251 State Agricultural College, Corvallis.
- 252 State University, Eugene City.
- 253 Library Association, Portland.
- 254 Oregon State Library, Salem.

PENNSYLVANIA.

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- 256 Bryn Mawr College, Bryn Mawr.
- 257 Dickinson College, Carlisle.
- 258 Lafayette College, Easton.
- 259 State Library, Harrisburg.
- 260 Haverford College, Haverford.
- 261 Academy of Natural Sciences, of Philadelphia, Philadelphia.
- 262 American Philosophical Society, Philadelphia.
- 263 Franklin Institute, Philadelphia.
- 264 Geological Survey of Pennsylvania, Philadelphia.
- 265 Library Company of Philadelphia, Philadelphia.
- 266 Library Company of Philadelphia, Rldgway Branch, Philadelphia.
- 267 Mercantile Library, Philadelphia.
- 268 University of Pennsylvania, Philadelphia.
- 269 Carnegie Library, Pittsburg.
- 270 Public Library, Scranton.
- 271 Lehigh University, South Bethlehem.
- 272 Pennsylvania State College, State College.
- 273 Osterhout Free Library, Wilkesbarre.

RHODE ISLAND.

- 274 Redwood Library, Newport.
- 275 Athenæum Library, Providence.
- 276 Brown University, Providence.
- 277 Providence Public Library, Providence.

SOUTH CAROLINA.

- 278 Charleston Library Society, Charleston.
- 279 South Carolina College, Columbia.
- 280 State Library, Columbia.

SOUTH DAKOTA.

- 281 South Dakota Agricultural College, Brookings.
- 282 Geological Survey of South Dakota, Vermilion.
- 283 University of South Dakota, Vermilion.
- 284 Yankton College, Yankton.

TENNESSEE.

- 285 Y. M. C. A. Library, Chattanooga.
- 286 University of Tennessee, Knoxville.
- 287 Cossitt Library, Memphis.
- 288 Tennessee State Library, Nashville.
- 289 Vanderbilt University, Nashville.
- 290 University of the South, Sewanee.

TEXAS.

- 291 Geological Survey of Texas, Austin.
- 292 Texas State Library, Austin.

- 293 University of Texas, Austin.
- 294 Public Library, Galveston.
- 295 Baylor University, Waco.

UTAH.

- 296 Utah Agricultural College, Logan City.
- 297 University of Utah, Salt Lake City.
- 298 Utah State Library, Salt Lake City.

VERMONT.

- 299 Free Library, Brattleboro.
- 300 University of Vermont, Burlington.
- 301 Middlebury College, Middlebury.
- 302 State Library, Montpelier.
- 303 Baxter Memorial Library, Rutland.

VIRGINIA.

- 304 Hampden-Sidney College, Hampden-Sidney.
- 305 Virginia Military Institute, Lexington.
- 306 Virginia State Library, Richmond.
- 307 Roanoke College, Salem.
- 308 University of Virginia, University P. O.

WASHINGTON.

- 309 Washington State Library, Olympia.
- 310 Public Library, Seattle.
- 311 University of Washington, Seattle.
- 312 City Library, Tacoma.

WEST VIRGINIA.

- 313 Geological Survey of West Virginia, Morgantown.
- 314 University of West Virginia, Morgantown.
- 315 Public Library, Wheeling.

WISCONSIN.

- 316 Beloit College, Beloit.
- 317 University of Wisconsin, Madison.
- 318 Wisconsin State Library, Madison.
- 319 Wisconsin State Historical Society, Madison.
- 320 Milwaukee Public Library, Milwaukee.

WYOMING.

- 321 State Geologist and Mining Engineer, Cheyenne.
- 322 University of Wyoming Library, Laramie.

HAWAIIAN ISLANDS.

- 323 Surveyor-General's Office, Honolulu.

AFRICA.

- 324 Commissioner of Crown Lands, Cape Town, Cape of Good Hope.
- 325 Geological Commission, Cape Town, Cape of Good Hope.
- 326 Geological Survey, Cairo, Egypt.
- 327 Geological Survey of the South African Republic, Pretoria, Transvaal.

SOUTH AMERICA.

ARGENTINA.

- 328 Departamento Nacional de Minas y Geologia, Buenos Aires.
- 329 Instituto Geografico Argentino, Buenos Aires.
- 330 Museo Nacional, Buenos Aires.
- 331 Museo de La Plata, La Plata.

BRAZIL.

- 332 Escola de Minas, Ouro Preto, Minas-Geraes.
- 333 Bibliotheca Nacional, Rio de Janeiro.
- 334 Comissão geographica e geologica de Minas Geraes, S. João d'El Rei.
- 335 Instituto Historico, Geographico e Ethnographico do Brazil, Rio de Janeiro.
- 336 Museu Nacional, Rio de Janeiro.

INDIA.

- 337 Royal Asiatic Society (Bombay Branch), Bombay.
- 338 Asiatic Society of Bengal, Calcutta.
- 339 Geological Survey of India, Calcutta.
- 340 Royal Asiatic Society (Ceylon Branch), Colombo, Ceylon.
- 341 Survey of India Department, Trigonometrical Branch Office, Dehra Dun.

JAPAN.

- 342 Chishitsu Kyoku (Geological Survey of Japan), Tokio.
- 343 Teikoku Daigaku (Imperial University), Tokio.

JAVA.

- 344 Java Geological Survey, Buitenzorg.

AUSTRALIA.

NEW SOUTH WALES.

- 345 Geological Survey of New South Wales, Sydney.

QUEENSLAND.

- 346 Geological Survey of Queensland, Brisbane.

SOUTH AUSTRALIA.

- 347 Geological Survey of South Australia, Adelaide.
- 348 Royal Society of South Australia, Adelaide.

TASMANIA.

- 349 Government Geologist, Launceston.

VICTORIA.

- 350 Department of Mines, Melbourne.
- 351 Geological Society of Australasia, Melbourne.

WESTERN AUSTRALIA.

- 352 Geological Survey of Western Australia, Perth.

NEW ZEALAND.

- 353 Colonial Museum and Geological Survey Department, Wellington.

AUSTRIA-HUNGARY.

- 354 Magyar Királyi Földtani Intézet, Budapest.
- 355 Magyarhoni Földtani Tarsulat (Hungarian Geological Society), Budapest.
- 356 Magyar Tudományos Akadémia, Budapest.
- 357 Akademia Umiejetno'sci, Krakau, Galicia.
- 358 Comité für Naturwissenschaftliche Landesdurchforschung, Prag, Bohemia.
- 359 K. böhmische Gesellschaft der Wissenschaften, Prag, Bohemia.
- 360 K. k. Geologische Reichsanstalt, Wien.

BELGIUM.

- 361 Commission Géologique de Belgique, Bruxelles.
- 362 Institut Cartographique Militaire, Bruxelles.
- 363 Musée Royale d'Histoire Naturelle de Belgique, Bruxelles.
- 364 Société Belge de Géologie, etc., Bruxelles.
- 365 Société Géologique de Belgique, Liège.

BOSNIA.

- 366 Geologische Landesaufnahme von Bosnien und Herzegovina, Sarajevo.

BULGARIA.

- 367 Institut Géologique, Sofia.

DENMARK.

- 368 Danmarks geologiske Undersøgelse, Copenhagen.

FRANCE.

- 369 Société Géologique de Normandie, Le Havre.
- 370 Société Géologique du Nord, Lille (Nord).
- 371 Annales des Sciences Géologiques, Paris.
- 372 Bibliothèque Nationale, Paris.
- 373 Hachette & Cie., Paris.
- 374 Ministère des Travaux Publics, Paris.
- 375 Muséum d'Histoire Naturelle, Paris.
- 376 Service de la Carte Géologique de la France, Paris.
- 377 Société Géologique de France, Paris.

GERMANY.

- 378 Deutsche Geologische Gesellschaft, Berlin.
- 379 Königliche Geologische Landes-Anstalt und Bergakademie, Berlin.
- 380 Königliches Kriegsministerium: Generalstab, Berlin.
- 381 Königlich Preussisches Oberbergamt, Bonn, Prussia.
- 382 Grossherzogliche hessische Geologische Anstalt, Darmstadt, Hesse.
- 383 Königliche Mineralogische-Geologische Museum, Dresden, Saxony.
- 384 Redaction von Petermanns Mittheilungen, Gotha, Saxe-Coburg.
- 385 Grossherzogliche Badische Geologische Landesanstalt, Heidelberg, Baden.
- 386 Geologische Landesuntersuchung des Königreichs Sachsen, Leipzig, Saxony.
- 387 Geognostische Landesuntersuchung, München, Bavaria.
- 388 Königlich Geodätisches Institut, Potsdam.
- 389 Grossherzoglich Mecklenburgische Geologische Landesanstalt, Rostock, Mecklenburg-Schwerin.
- 390 Commission für die geologische Landes-Untersuchung von Elsass-Lothringen, Strassburg, Elsass.
- 391 K. Württembergisches Statistisches Landesamt, Stuttgart, Württemberg.

GREAT BRITAIN.

ENGLAND.

- 392 Liverpool Geological Society, Liverpool.
- 393 British Museum (General Library), London.
- 394 Geological Society of London, London.
- 395 Geological Survey of the United Kingdom, London.
- 396 Royal Society of London, London.
- 397 Manchester Geological Society, Manchester.
- 398 Bodleian Library, Oxford.
- 399 Royal Geological Society of Cornwall, Penzance.
- 400 Ordnance Trigonometrical Survey of Great Britain and Ireland, Southampton.

IRELAND.

- 401 Geological Survey of Ireland, Dublin.
- 402 National Library of Ireland, Dublin.

SCOTLAND.

- 403 Edinburgh Geological Society, Edinburgh.
- 404 Geological Survey of Scotland, Edinburgh.
- 405 Royal Scottish Geographical Society, Edinburgh.
- 406 Library of the University of Edinburgh, Edinburgh.
- 407 Geological Society, Glasgow.

ITALY.

- 408 Museo di Geologia e Paleontologia del R. Istituto di Studi Superiori, Firenze.
- 409 Istituto Cartografico Italiano, Rome.
- 410 R. Comitato Geologico d'Italia, Rome.
- 411 Società Geografica Italiana, Rome.

NETHERLANDS.

- 412 Koninklijke Akademie van Wetenschappen, Amsterdam.
- 413 Commission Géodésique Néerlandaise, Delft.

NORWAY.

- 414 Bergens Museum, Bergen.
- 415 Kongelige Norske Universitet i Christiania, Christiania.
- 416 Norges Geografiske Opmaalning, Christiania.
- 417 Norges Geologiske Undersøgelse, Christiania.

PORTUGAL.

- 418 Comissão Central Permanente de Geographia, Lisboa.
- 419 Comissão dos Trabalhos Geologicos, Lisboa.

ROUMANIA.

- 420 Directiunea Biuroului Geologicu, Bucharest.

RUSSIA.

- 421 Finlanda Geologiska Undersökning, Helsingfors, Finland.
- 422 Société de Géographie de Finlande, Helsingfors, Finland.
- 423 K. Russische Geographische Gesellschaft, Irkoutsk, Siberia.
- 424 Cabinet de Géographie de l'Université de Moscou, Moscow.
- 425 Académie Impériale des Sciences, St. Petersburg.

- 426 Bibliothèque Impériale Publique, St. Petersburg.
- 427 Comité Géologique, St. Petersburg.
- 428 Kaiserliche Russische Geographische Gesellschaft, St. Petersburg.
- 429 Section Géologique du Cabinet de sa Majesté (Ministère de la Maison de l'Empereur), St. Petersburg.
- 430 Section Topographique de l'Etat Major, St. Petersburg.

SERVIA.

- 431 Annales Géologiques de la Péninsule Balkanique, Belgrade.

SPAIN.

- 432 Comisión del Mapa Geológico de España, Madrid.
- 433 Instituto Geográfico y Estadístico, Madrid.
- 434 Real Academia de Ciencias de Madrid, Madrid.
- 435 Sociedad Geográfica de Madrid, Madrid.

SWEDEN.

- 436 General Stabens Topografiska Afdelning, Stockholm.
- 437 Geologiska Byrån, Stockholm.
- 438 Library of the University of Upsala.

SWITZERLAND.

- 439 Département Fédéral de l'Intérieur, Section des Travaux Publics, Berne.
- 440 Société Géologique Suisse, Berne.
- 441 Société de Physique et d'Histoire Naturelle, Genève.
- 442 Commission Géologique Suisse, Zurich.

**APPENDIX TO TWENTIETH ANNUAL REPORT OF THE
DIRECTOR OF THE UNITED STATES
GEOLOGICAL SURVEY**

TRIANGULATION AND SPIRIT LEVELING

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APPENDIX TO DIRECTOR'S REPORT: TRIANGULATION AND SPIRIT LEVELING.

The data included in this Appendix have been assembled for publication by Messrs. H. M. Wilson, J. H. Renshawe, E. M. Douglas, and R. U. Goode, chiefs of the Atlantic, Central, Rocky Mountain, and Pacific sections of topography.

TRIANGULATION.

The methods adopted in 1896 for the conduct of triangulation and primary traverse for the control of topographic sketching have not been materially changed, but because of the difficulties that have arisen from "station errors" in astronomic locations, greater efforts are now being made to secure more than one astronomic location for each area under survey. During the year 1898-99 connections were made between two astronomic stations in Texas, Wyoming, and Montana, but the adjustments were not completed in time to include the results in this report.

The ratio of meters to inches at present in use is 1 meter = 39.37 inches. The geodetic constants used for all computations are those given in the United States Coast and Geodetic Survey Report for 1894.¹ The distribution of work is shown on Pl. II, in pocket.

Summary of published results, 1898-99: Astronomy, triangulation, primary traverse, and meridian marks.

Locality.	Astronomic stations.	Triangulation stations.	Traverse stations.	Meridian marks.
New York		9		
Maryland		12		1
West Virginia.....		5		43
Pennsylvania		1		
Ohio		6		
Tennessee.....	1		* 86	
Minnesota.....				4

¹ Appendix 9, Report for 1894, Formulas and Tables for the Computation of Geodetic Positions.

Summary of published results, 1898-99: Astronomy, triangulation, primary traverse, and meridian marks—Continued.

Locality.	Astronomic stations.	Triangulation stations.	Traverse stations.	Meridian marks.
North Dakota				7
Arkansas				6
South Dakota and Wyoming		15		2
Utah		14		1
Idaho and Montana		13		1
Washington		5		
Oregon		9		
Southern California		5		
Total	1	94	86	65

DESCRIPTIONS AND POSITIONS OF STATIONS, ARRANGED BY STATES.

NEW YORK.

The following stations in central New York were located by Mr. W. T. Griswold in 1898.

The positions of Genoa and Sweet Hill are based upon Ovid and Clyde, of the New York State survey. The positions of Murray and Geneva are based upon Newfield and Niles, of the same survey. The positions of Turks Hill, Eccentric, Orleans, Cheshire, Bare Hill, and Potter, are based upon the Lake Survey positions of Turks Hill and Palmyra, as adjusted by the New York State survey.

GENOA, CAYUGA COUNTY.

Situated on land of James McDermott, in town of Genoa, on the highest of three small hills on top of ridge to the west of village of Genoa.

Station mark: Cut stone, 12 by 3 by 3 inches, marked "U. S. G. S.," and sunk 1 foot under ground.

Station number: 500.

[Latitude, 42° 41' 06.73". Longitude, 76° 33' 13.74".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Murray	49 07 58.87	228 58 12.11	4.4175954
Newfield	16 02 07.83	195 57 26.00	4.5380981

SENECA FALLS, SENECA COUNTY.

Water standpipe. (Not occupied.)

[Latitude, $42^{\circ} 55' 14.58''$. Longitude, $76^{\circ} 47' 38.62''$.]

To station—	Asimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Geneva	66 17 46.21	246 08 42.82	4.2966947
Sweet Hill.....	21 44 16.97	201 42 12.80	4.0496411

MURRAY, SENECA COUNTY.

Situated on land owned by William Murray, in the town of Lodi, on the highest point of ridge between Seneca and Cayuga lakes, about 300 yards north of the road from Trumansburg to North Hector and 8 miles from Trumansburg.

Station mark: Stone post, 48 by 6 by 6 inches, set 42 inches in the ground, in the center of top of which is cemented a copper bolt.

Station number: 501.

[Latitude, $42^{\circ} 31' 51.16''$. Longitude, $76^{\circ} 47' 40.48''$.]

To station—	Asimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Niles.....	224 37 40.68	44 52 19.62	4.6227649
Newfield	327 18 33.27	147 23 36.95	4.2799573

SWEET HILL, SENECA COUNTY.

Situated in the town of Fayette, at the highest point of hill locally known as Democrat Hill, two miles east of West Fayette and 6 miles south of Waterloo.

Station mark: Stone post of the New York State survey.

Station number: 99.

[Latitude, $42^{\circ} 49' 37.07''$. Longitude, $76^{\circ} 50' 41.42''$.]

To station—	Asimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Geneva	99 55 11.20	279 48 12.57	4.1520561
Clyde.....	176 28 18.59	356 27 32.38	4.3976109

WATERLOO, SENECA COUNTY.

Water standpipe. (Not occupied.)

[Latitude, 42° 54' 06.38". Longitude, 76° 52' 28.99".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Geneva	63 02 07.30	242 56 21.57	4.1121019
Sweet Hill.	343 36 52.42	163 38 05.58	3.9375948

GENEVA, ONTARIO COUNTY.

Situated in the town of Geneva, just west of the city limits of Geneva on a fence line running from Premption road and separating the farms of Henry Doris and John Ross.

Station mark: Stone post, 48 by 6 by 6 inches, set 42 inches in the ground, in center of top of which is cemented a copper bolt.

Station number: 498.

[Latitude, 42° 50' 55.85". Longitude, 77° 00' 57.12".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Clyde	208 50 20.63	28 56 33.87	4.4099598
Ovid	319 52 23.23	140 00 17.77	4.3925375

ORLEANS, ONTARIO COUNTY.

Situated in town of Phelps, on highest part of north and south ridge, about 2 miles from Clifton Springs and 1 mile from Orleans; one-eighth mile east of road from Orleans to Clifton Springs.

Station mark: Stone post, 48 by 6 by 6 inches, set 42 inches in the ground, in center of top of which is cemented a copper bolt.

Station number: 491.

[Latitude, 42° 55' 44.41". Longitude, 77° 07' 25.47".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Palmyra	169 00 21.86	348 58 51.62	4.1958451
Turks Hill	115 37 05.69	295 24 51.82	4.4317327

CLIFTON SPRINGS, ONTARIO COUNTY.

Cupola of sanitarium. (Not occupied.)

[Latitude, $42^{\circ} 50' 42.37''$. Longitude, $77^{\circ} 19' 49.13''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Cheshire	50 52 18.10	230 44 23.30	4.3099819
Turks Hill	109 09 02.13	288 57 19.62	4.3924640

CHESHIRE, ONTARIO COUNTY.

Situated on highest point of a bare hill $1\frac{1}{2}$ miles north of the village of Cheshire, Canandaigua Township, on land owned by Warren Outhouse.

Station mark: Stone post, 48 by 6 by 6 inches, set 42 inches in the ground, in center of top of which is cemented a copper bolt.

Station number: 490.

[Latitude, $42^{\circ} 57' 40.47''$. Longitude, $77^{\circ} 08' 11.67''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Turks Hill Eccentric	160 14 26.27	340 10 39.65	4.3478537
Orleans	241 01 03.25	61 59 29.34	4.2850665

MARYLAND-WEST VIRGINIA-PENNSYLVANIA.

This triangulation is based upon two positions established by the United States Coast and Geodetic Survey—Sugar Loaf and Maryland Heights, near Harpers Ferry, West Virginia, and extends westward along the Potomac River to near the western border of Maryland. The field work was done by R. H. Chapman, W. J. Peters, and George T. Hawkins, during 1897 and 1898. All angles were measured with Fauth 8-inch theodolites. Average closure error of triangles in belt = $6.3''$.

SUGAR LOAF, MONTGOMERY COUNTY, MARYLAND.

A station of the United States Coast and Geodetic Survey, on a prominent point about 4 miles northeast of Barnesville. The point occupied is on a solid rock on southern edge of summit.

Station mark: Copper bolt set in solid rock. The summit was covered with timber through which sight lines were cut to Maryland Heights and Lookout stations.

[Latitude, 39° 15' 44.55". Longitude, 77° 23' 36.88".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Maryland Heights.....	107 29 59.85	287 17 43.18	4.4654339
Lookout	135 40 46.85	315 31 51.51	4.4607793

LOOKOUT, MARYLAND.

On line between Frederick and Washington counties, about 2 miles northeast of Rohrersville. Instrument raised 60 feet above ground for observing. Lines of sight were cut through timber to Sugar Loaf, Maryland Heights, Birch, and Fairview.

Station mark: Copper bolt in a stone set in the ground.

[Latitude, 39° 28' 53.98". Longitude, 77° 37' 41.10".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Sugar Loaf.....	315 31 51.51	135 40 46.85	4.4607793
Maryland Heights.....	32 39 51.61	212 36 29.27	4.1506384
Birch	85 36 59.23	265 19 24.65	4.6002185
Fairview.....	128 15 41.11	308 02 37.93	4.5721983

MARYLAND HEIGHTS, WASHINGTON COUNTY, MARYLAND.

A station of the United States Coast and Geodetic Survey, near the county line, about 2 miles northeast of Harpers Ferry, West Virginia, on summit and just south of old fort on mountain locally known as Maryland Heights.

Station mark: Copper bolt set in solid rock, about 2 feet below the surface of ground.

Reference marks: Arrowheads cut on rocks pointing to the center.

[Latitude, 39° 20' 27.69". Longitude, 77° 42' 59.91".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Birch	105 23 26.58	285 09 15.48	4.5222034
Fairview	148 11 08.06	328 01 28.55	4.6149155
Lookout	212 36 29.27	32 39 51.61	4.1506384
Sugar Loaf.....	287 17 43.18	107 29 59.85	4.4654339

FAIRVIEW, WASHINGTON COUNTY, MARYLAND.

On the highest part of a prominent peak about midway between Hagerstown and Hancock, and about one-half mile north of the National turnpike. The summit was cleared of all timber except a small chestnut oak, which was trimmed up and used for the signal.

Station mark: Small chestnut oak tree.

Reference mark: Copper bolt cemented in solid rock, distant from station 3.8 feet, the azimuth from station being $104^{\circ} 10'$.

[Latitude, $39^{\circ} 39' 21.99''$. Longitude, $77^{\circ} 58' 11.00''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Lookout	308 02 37.93	128 15 41.11	4.5721983
Maryland Heights.....	328 01 28.55	148 11 08.06	4.6149155
Birch	21 26 40.67	201 22 06.71	4.4495832
Sleepy	72 32 44.79	252 27 05.50	4.1237931
Sideling.....	89 37 12.94	269 23 35.17	4.4850085

BIRCH, BERKELEY COUNTY, WEST VIRGINIA.

On the highest point of a ridge, about 8 miles southwest of Martinsburg. The summit was cleared of all timber except one tree, which was trimmed up and used for a signal.

Station mark: Signal tree.

Reference mark: Copper bolt cemented in rock; distant from tree, 4.5 feet; azimuth from signal tree, $250^{\circ} 36'$.

[Latitude, $39^{\circ} 25' 11.97''$. Longitude, $78^{\circ} 05' 21.35''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Capon (2)	122 26 20.08	302 17 46.42	4.3591566
Sleepy	173 46 47.67	353 45 43.07	4.3492225
Fairview.....	201 22 06.71	21 26 40.67	4.4495832
Lookout	265 19 24.65	85 36 59.23	4.6002185
Maryland Heights.....	285 09 15.48	105 23 26.58	4.5222034

SLEEPY, MORGAN COUNTY, WEST VIRGINIA.

About 8 miles east of Berkeley Springs, West Virginia, and about the same distance southeast of Hancock, Maryland; near the north end of Sleepy Creek Mountain and 1 mile south of the Berkeley Springs and Martinsburg road. The summit of the ridge was cleared of all timber near the station except one tree, which was trimmed up and left for a signal.

Station mark: Signal tree.

Reference mark: A deep cross cut in solid rock; distant from station, 4.6 feet; azimuth from station, $131^{\circ} 23'$.

[Latitude, $39^{\circ} 37' 12.31''$. Longitude, $78^{\circ} 07' 02.86''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Birch	353 45 43.07	173 46 47.67	4.3492225
Fairview	252 27 05.50	72 32 44.79	4.1237931
Sideling	101 52 22.15	281 44 24.00	4.2615023
Capon (2)	59 27 16.94	239 19 46.86	4.2920536

CAPON (2), MORGAN COUNTY, WEST VIRGINIA.

On high part of Capon Mountain, 8 miles southwest of Berkeley Springs, the timber was cleared from about 2 acres of ground with the exception of one tree, which was left standing for a signal.

Station mark: Signal tree.

Reference mark: Copper plug cemented in rock, distant from tree 3.7 feet, azimuth of which is $312^{\circ} 27'$.

[Latitude, $39^{\circ} 31' 48.87''$. Longitude, $78^{\circ} 18' 49.32''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Warrior	111 01 16.07	290 49 32.12	4.4507669
Evitts	124 09 18.70	303 55 52.57	4.5609328
Sideling	175 42 56.51	355 42 29.05	4.1382862
Sleepy	239 19 46.86	59 27 16.94	4.2920536
Birch	302 17 46.42	122 26 20.08	4.3591566

SIDELING, WASHINGTON COUNTY, MARYLAND.

About 10 miles west of Hancock and 3 miles north of Orleans. Station is on high point on Sideling Ridge, about 1 mile from George Morris's dwelling, which is 3 miles south of National turnpike. The timber was cleared from the summit of the knob, except one tree, which was trimmed and left standing for a signal.

Station mark: Signal tree.

Reference mark: Copper bolt cemented in solid rock, distant from tree 16.3 feet, azimuth of which is $265^{\circ} 39'$.

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[Latitude, 39° 39' 13.46". Longitude, 78° 19' 32.40".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Fairview.....	269 23 35.17	89 37 12.94	4.4850085
Sleepy	281 44 24.00	101 52 22.15	4.2615023
Capon (2)	355 42 29.05	175 42 56.51	4.1382862
Warrior.....	81 56 23.41	261 45 06.03	4.4078951
Evitts.....	102 59 53.36	282 46 53.70	4.4749228

WARRIOR, ALLEGANY COUNTY, MARYLAND.

About 12 miles east of Cumberland, on north end of Warrior Mountain. The timber was cleared from north end of mountain and lines of sight cut to Capon and Nat stations.

Station mark: Copper bolt cemented in solid rock.

[Latitude, 39° 37' 15.81". Longitude, 78° 37' 14.25".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Nat.....	17 07 47.97	197 02 07.44	4.6399604
Pinnacle	56 12 08.98	235 54 39.53	4.6768319
Dan	79 42 39.96	259 32 04.18	4.3835988
Sampson	110 06 41.28	289 54 51.30	4.4505251
Evitts	159 46 24.36	339 44 42.78	4.0399610
Sideling	251 45 06.03	81 56 23.41	4.4078951
Capon (2)	290 49 32.12	111 01 16.07	4.4507669

EVITTS, ALLEGANY COUNTY, MARYLAND.

About 7 miles northeast of Cumberland and 2 miles from National turnpike, on the southern slope of Evitts Mountain, in an old field.

Station mark: Copper bolt cemented in a rock sunk in the ground.

[Latitude, 39° 42' 49.36". Longitude, 78° 39' 53.38".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Sideling	282 46 53.70	102 59 53.36	4.4749228
Capon (2)	303 55 52.57	124 09 18.70	4.5609328
Warrior.....	339 44 42.78	159 46 24.36	4.0399610
Dan	53 50 20.78	233 41 26.02	4.3939884
Sampson	88 29 45.78	268 19 36.79	4.3562999

NAT, HAMPSHIRE COUNTY, WEST VIRGINIA.

On highest part of the Nathaniel Mountain, about 10 miles south of Romney. The summit was cleared of timber with the exception of one large tree, which was trimmed and used for a signal.

Station mark: Signal tree.

Reference mark: Copper bolt cemented in rock, distant from station 3.7 feet; azimuth from signal tree, $212^{\circ} 09'$.

[Latitude, $39^{\circ} 14' 42.93''$. Longitude, $78^{\circ} 46' 10.35''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Pinnacle	119 45 11.13	299 33 25.53	4.4871668
Dan	163 35 32.50	343 30 39.72	4.5906124
Warrior	197 02 07.44	17 07 47.97	4.6399604

DAN, GARRETT COUNTY, MARYLAND.

On a large pile of rocks which stands above the timber, about 8 miles south of Frostburg and 3 miles from Vale Summit station.

Station mark: Copper bolt cemented in solid rock.

[Latitude, $39^{\circ} 31' 54.54''$. Longitude, $78^{\circ} 53' 51.47''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Pinnacle	35 10 40.34	215 03 45.41	4.4331252
High Rock	76 29 57.72	256 22 20.33	4.2463642
Meadow (2)	114 23 15.43	294 15 18.02	4.2921955
Sampson	168 55 52.46	348 54 39.03	4.1547327
Evitts	233 41 26.02	53 50 20.78	4.3939884
Warrior	259 32 04.18	79 42 39.86	4.3835988
Nat	343 30 39.72	163 35 32.50	4.5906124

SAMPSON, ALLEGANY COUNTY, MARYLAND.

On a high point of Savage Mountain, about 7 miles north of Frostburg. About 100 feet east of "Sampson Rock." The timber is low on the top of the mountain, the backbone of the ridge being rocky.

Station mark: Copper bolt cemented in solid rock.

[Latitude, $39^{\circ} 42' 28.94''$. Longitude, $78^{\circ} 55' 46.56''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Evitta	268 19 36.78	88 29 45.78	4.3562999
Warrior.....	289 54 51.30	110 06 41.28	4.4505251
Dan.....	348 54 39.03	168 55 52.46	4.1547327
Meadow (2)	68 34 20.31	248 27 35.75	4.2102258
Negro.....	94 58 04.81	274 47 40.23	4.3685614

PINNACLE, MINERAL COUNTY, WEST VIRGINIA.

On highest point of mountain. About 12 miles south of Keyser.
The station is on a rock that rises above the timber.

Station mark: Copper bolt cemented in solid rock.

[Latitude, $39^{\circ} 22' 55.53''$. Longitude, $79^{\circ} 04' 44.04''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
High Rock	175 02 27.33	355 01 45.68	4.2578313
Dan.....	215 03 45.41	35 10 40.34	4.4331252
Warrior.....	235 54 39.53	56 12 08.98	4.6768319
Nat.....	299 33 25.53	119 45 11.13	4.4871668

HIGH ROCK, GARRETT COUNTY, MARYLAND.

On high point of rocks on Savage Mountain, about 12 miles north-east of Piedmont, West Virginia, and 22 miles southwest of Frostburg, Maryland.

Station mark: Small pine tree.

Reference mark: Copper bolt cemented in solid rock, distant from signal tree 6 feet; azimuth to signal tree, $350^{\circ} 48'$.[Latitude, $39^{\circ} 32' 40.43''$. Longitude, $79^{\circ} 05' 49.59''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Accident	117 56 25.56	297 48 53.18	4.2825359
Meadow (2)	176 35 05.20	356 34 45.72	4.0873862
Dan.....	256 22 20.33	76 29 57.72	4.2463642

MEADOW (2), GARRETT COUNTY, MARYLAND.

On highest part of Meadow Mountain, about 12 miles northwest of Frostburg and 1 mile north of New Germany post-office. The summit was cleared of timber with the exception of one tree, which was trimmed up and left for a signal.

Station mark: Signal tree.

Reference mark: Copper bolt cemented in solid rock, distant from signal tree 15 feet; azimuth from signal tree, 346° 43'.

[Latitude, 39° 39' 16.25". Longitude, 79° 06' 20.15".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Accident.....	78 43 55.90	258 36 42.49	4. 2180560
Negro.....	134 05 59.85	314 02 20.27	4. 0570135
Sampson.....	248 27 35.75	68 34 20.31	4. 2102258
Dan.....	294 15 18.02	114 23 15.43	4. 2921955
High Rock.....	356 34 45.72	176 35 05.20	4. 0873862

NEGRO, SOMERSET COUNTY, PENNSYLVANIA.

On flat-topped mountain about 4 miles northwest of Grantsville, Maryland, and 2 miles north of National turnpike. Lines of sight were cut out to different stations from a tree which was trimmed and left for a signal.

Station mark: Signal tree.

Reference mark: Copper bolt cemented in rock; distant from tree, 3 feet; azimuth from signal tree, 2° 37'.

[Latitude, 39° 43' 33.41". Longitude, 79° 12' 03.98".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Accident.....	35 36 51.63	215 33 17.41	4. 1330708
Sampson.....	274 47 40.23	94 58 04.81	4. 3685814
Meadow (2).....	314 02 20.27	134 05 59.85	4. 0570135

ACCIDENT, GARRETT COUNTY, MARYLAND.

About 20 miles north of Oakland and about 2 miles east of Accident. Signal is lone tree in field, trimmed up and standing on a line with a rail fence.

Station mark: Signal tree.

Reference mark: Copper bolt cemented in a stone set 3 feet in the ground; distant from signal tree, 10.6 feet; azimuth from tree, 348° 43'.

[Latitude, 39° 37' 31.02". Longitude, 79° 17' 39.52".]

To station—	Asimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Negro	215 33 17.41	35 36 51.63	4.1380708
Meadow (2)	258 36 42.49	78 43 55.90	4.2180560
High Rock	297 48 53.18	117 56 25.56	4.2825359

MARYLAND MERIDIAN MARK.

HAGERSTOWN, WASHINGTON COUNTY.

Location of station: On the county farm, about 1½ miles north of the town.

Station mark: A marble post, 42 by 8 by 8 inches, set 38 inches in the ground, in driveway from pike to the main building. In center of top of post is cemented a bronze tablet.

Distant mark: A marble post, 42 by 8 by 8 inches, set 38 inches in the ground, near line of fence on north side of county farm.

WEST VIRGINIA MERIDIAN MARKS.

In order to give a complete list of meridian marks for each county seat in the State, 12 stations established by the United States Coast and Geodetic Survey are included, due credit for the same being given.

The field work for the Geological Survey was executed by Mr. George T. Hawkins, topographer, and Mr. E. L. Faison, field assistant.

West Virginia meridian marks, in order of counties.

County.	City.	Date.	Magnetic declination (west).	Authority.
		1898.		
Barbour	Philippi	July 26, 27	3 27.0	U. S. C. & G. S.
Berkeley	Martinsburg	May 27	4 27	U. S. G. S.
Boone	Madison	Aug. 29	2 11	U. S. G. S.
Braxton	Sutton	June 29	2 16.3	U. S. C. & G. S.
Brooke	Wellsburg	Dec. 14	1 34	U. S. G. S.
Cabell	Huntington	May 30, 31	0 51.2	U. S. C. & G. S.
Calhoun	Grantsville	July 22	1 15	U. S. G. S.
Clay	Clay	Nov. 12	1 21	U. S. G. S.
Doddridge	West Union	July 12	2 20	U. S. G. S.
Fayette	Fayetteville	Nov. 8	1 28	U. S. G. S.
Gilmer	Glenville	July 17	2 08	U. S. G. S.
Grant	Petersburg	June 14	3 37	U. S. G. S.
Greenbrier	Lewisburg	Oct. 22	1 41	U. S. G. S.
Hampshire	Romney	June 10	2 46	U. S. G. S.
Hancock	New Cumberland	Dec. 15	1 38	U. S. G. S.

West Virginia meridian marks, in order of counties—Continued.

County.	City.	Date.	Magnetic declination (west).	Authority.
1898.			0 /	
Hardy	Moorefield	June 12	3 37	U. S. G. S.
Harrison	Clarksburg	June 24, 25	2 49.5	U. S. C. & G. S.
Jackson	Ripley	Nov. 25	1 25	U. S. G. S.
Jefferson	Charlestown	June 6	3 32	U. S. G. S.
Kanawha	Charleston	June 7, 8	1 56.7	U. S. C. & G. S.
Lewis	Weston	July 6	2 31.3	U. S. C. & G. S.
Lincoln	Hamlin	Nov. 15	1 32	U. S. G. S.
Logan	Logan	Aug. 31	1 31	U. S. G. S.
McDowell	Welch	Oct. 31	1 48	U. S. G. S.
Marion	Fairmont	July 4	3 21	U. S. G. S.
Marshall	Moundsville	Dec. 10	1 07	U. S. G. S.
Mason	Point Pleasant	Nov. 20	1 21	U. S. G. S.
Mercer	Princeton	Oct. 28	1 33	U. S. G. S.
Mineral	Keyser	June 21	3 57	U. S. G. S.
Mingo	Williamson	Nov. 4	1 42	U. S. G. S.
Monongalia	Morgantown	June 30	3 21	U. S. G. S.
Monroe	Union	Oct. 25	1 43	U. S. G. S.
1897.				
Morgan	Berkeley Springs	Nov. 21	4 36	U. S. G. S.
1898.				
Nicholas	Summersville	Aug. 25	3 14	U. S. G. S.
Ohio	Wheeling	July 21	1 01.3	U. S. C. & G. S.
Pendleton	Franklin	June 18	2 45	U. S. G. S.
Pleasants	Saint Marys	Nov. 30	1 04	U. S. G. S.
Pocahontas	Marlinton	Aug. 16	3 31	U. S. G. S.
Preston	Kingwood	June 26	3 39	U. S. G. S.
Putnam	Winfield	Nov. 18	1 30	U. S. G. S.
Raleigh	Beckley	Oct. 11	1 42	U. S. G. S.
Randolph	Beverly	July 29	2 45.3	U. S. C. & G. S.
Ritchie	Harrisville	June 21, 22	1 28.5	U. S. C. & G. S.
Roane	Spencer	July 28	1 43	U. S. G. S.
Summers	Hinton	Oct. 20	1 23	U. S. G. S.
Taylor	Grafton	June 23	3 38	U. S. G. S.
Tucker	Parsons	July 7	3 22	U. S. G. S.
Tyler	Middlebourne	Dec. 3	1 36	U. S. G. S.
Upshur	Buckhannon	July 1, 2	3 00	U. S. C. & G. S.
Way	Wayne	May 26	0 44.6	U. S. C. & G. S.
Webster	Addison	Aug. 21	3 16	U. S. G. S.
Wetzel	New Martinsville	Dec. 8	0 59	U. S. G. S.
Wirt	Elizabeth	Nov. 28	2 28	U. S. G. S.
Wood	Parkersburg	June 17, 18	1 13.7	U. S. C. & G. S.
Wyoming	Oceana	Oct. 5	1 37	U. S. G. S.

West Virginia Meridian Marks, in order of County Seats.

ADDISON, WEBSTER COUNTY.

Location of station: In grounds of Webster Springs Hotel, 6 feet north of south fence.

Station mark: A sandstone post 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze meridian-mark tablet. Reference marks: Southeast corner of tenpin alley, S. 16° W., 258 feet distant; southwest corner of hotel, N. 23° W., 247 feet distant; southeast corner of hotel, N. 10° W., 270 feet distant; southwest corner of bath house, N. 10° E., 369.6 feet distant.

Distant mark: North of station 339.6 feet. A sandstone post 30 by 8 by 8 inches, set 30 inches in the ground. Aluminum bolt in center of top of post. Reference marks: Southeast corner of hotel, S. 22° W., 68 feet distant; northeast corner of hotel, N. 55° W., 110 feet distant; northeast corner of bath house, N. 50° E., 114 feet distant.

Resident referee: Mr. T. A. Gregory, county clerk.

Magnetic declination: $3^{\circ} 16'$ W. August 21, 1898, at 9.40 a. m. Mean annual change, $+ 03.5'$.

BECKLEY, RALEIGH COUNTY.

Location of station: On north side of sidewalk and south side of Main street; west side of town, opposite Mr. Anderson's house.

Station mark: A sandstone post 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Small white house, N. 45° E., 98.6 feet distant; small white house, N. 63° W., 212.5 feet distant; Anderson's house, S. 32° E., 72.8 feet distant.

Distant mark: North of station 1,249.1 feet. A sandstone post 36 by 8 by 8 inches, set 36 inches in the ground on hillside across small ravine. Aluminum bolt in center of top of post. Reference marks: Black gum tree 8 inches in diameter, S. 12° W., 140.8 feet distant; oak tree 12 inches in diameter, N. 53° W., 90.3 feet distant; pine tree 10 inches in diameter, N. 20° E., 27.6 feet distant.

Resident referee: Mr. J. F. Davis, county clerk.

Magnetic declination: $1^{\circ} 42'$ W. October 11, 1898, at 11 a. m. Mean annual change, $+ 03.5'$.

BERKELEY SPRINGS, MORGAN COUNTY.

Location of station: State land adjoining the Berkeley Springs Hotel.

Station mark: A sandstone post 36 by 6 by 6 inches, set 30 inches in the ground, 12 feet from fence on northeast side of ground. Reference mark: "Washington elm," N. 20° E., 18 feet distant.

Distant mark: North of station 300 feet. A limestone post 36 by 6 by 6 inches, set 30 inches in the ground, 14 feet west of iron gate.

Magnetic declination: $4^{\circ} 36'$ W. November 21, 1897. Mean annual change, $+ 03'$. (Approximate.)

BEVERLY, RANDOLPH COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: In the south end of town in Dr. H. Yokum's yard on west side of Main street.

Station mark: A heavy sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station 350 feet, near the fence on east side of Main street.

BUCKHANNON, UPSHUR COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On ground of West Virginia Conference Seminary, in main lot in front of the present building.

Station mark: A blue sandstone post, in the center of top of which is cemented a bronze tablet.

Distant mark: South of station, 450 feet. A sandstone post in front of and between two brick buildings and near a brick walk leading from the southwest corner of lot to the main building.

Resident referees: Mr. W. G. L. Totten and Mr. O. L. Mullins, surveyors, assisted in setting the mark.

CHARLESTOWN, JEFFERSON COUNTY.

Location of station: Near angle in wall at northeast corner of Methodist Episcopal church.

Station mark: A sandstone post, 40 by 10 by 7 inches, set 36 inches in the ground, in the center of top of which is a bronze tablet. Reference marks: West to a wall of church, 4.9 feet; south to a wall of church, 10 feet; to northeast corner of body of church, 8.9 feet; to the northeast corner of extension of church, 10.3 feet.

Distant mark: North of station, 767 feet. A limestone post, 30 by 10 by 7 inches, set 28 inches in the ground. Aluminum bolt in center of top of post. Reference mark: Southeast corner of harness factory, S. 60° E., 76.5 feet distant.

Resident referee: County surveyor.

Magnetic declination: $3^{\circ} 32'$ W. June 6, 1898. Mean annual change, $+ 04'$.

CHARLESTON, KANAWHA COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On Capitol Hill, on property of Mr. J. S. Savage, 140 feet above the general level of the ground.

Meridian marks: Three stone posts determine the meridian. One is a sandstone set 75.25 feet south of station in the lawn about Mr. Savage's house; one is set on a hill about 1 mile north on land belonging to Jefferson Savage, and one is on the side of a hill about $1\frac{1}{2}$ miles south. Each post has a copper bolt in center of top.

Resident referees: Judge John S. McDonalds, of county court, and Mr. William S. Brown, county surveyor.

CLARKSBURG, HARRISON COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: In public school grounds, 170 feet east of public school building.

Station mark: A sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station, 735 feet. On opposite side of valley of Elk Creek near bridge crossing on Baltimore and Ohio Railroad tracks.

Resident referee: Mr. J. H. Davis, civil engineer. The north mark was set under his direction.

CLAY, CLAY COUNTY.

Location of station: Corner of Main street and Third alley.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. **Reference marks:** Southwest corner of Main street and Third alley, N. 88° W., 33.4 feet distant; northwest corner of Main street and Third alley, N. 10° W., 62.7 feet distant; northeast corner of Main street and Third alley, N. 20° E., 52.9 feet distant; southeast corner of Main street and Third alley, due east, 5.7 feet distant.

Distant mark: North of station, 365.2 feet. A sandstone post, 36 by 8 by 8 inches, set 6 inches in the ground, west of Baptist church and along east fence to Davenport's yard. Aluminum bolt in center of top of post. **Reference marks:** Southwest corner of Baptist church, S. 75° E., 73 feet distant; northwest corner of Baptist church, N. 60° E., 83.5 feet distant; southeast corner of Davenport's house, N. 15° W., 46.2 feet distant.

Resident referee: Mr. W. T. Hemerick, county clerk.

Magnetic declination: $1^{\circ} 21'$ W. November 12, 1898, at 10.45 a. m. Mean annual change + $03.5'$.

ELIZABETH, WIRT COUNTY.

Location of station: On the south side of Washington street near the southeast corner of court-house grounds.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is a bronze tablet. **Reference**

marks: Southwest corner of L. H. Wells's house, 53.6 feet distant; northwest corner of L. H. Wells's house, 71.5 feet distant; northeast corner of W. V. Vernon's store, 59.3 feet distant; northwest corner of W. V. Vernon's store, 18.1 feet distant.

Distant mark: North of station, 321.1 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, in court-house yard along Main street. Aluminum bolt in center of top of post. Reference marks: Northwest corner of court-house, S. 70° E., 92.2 feet distant; northeast corner of court-house, due east, 65.4 feet distant.

Resident referee: Mr. S. W. Cain, county clerk.

Magnetic declination: $2^{\circ} 28'$ W. November 28, 1898, at 10 a. m. Mean annual change $+ 04'$.

FAIRMONT, MARION COUNTY.

Location of station: Mound in northeast corner of normal-school yard.

Station mark: A sandstone post, 44 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is a bronze tablet. Reference marks: A 10-inch sycamore tree, S. 25° W., 12 feet distant; northeast steps of normal-school building, S. 35° E., 55 feet distant; northeast corner of normal-school lot, N. 5° W., 75 feet distant.

Distant mark: North of station, 2,404 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground. Aluminum bolt in center of top of post. It is 40 feet west of street running northwest on hillside across ravine.

Resident referee: Mr. T. L. Burchinal, county commissioner.

Magnetic declination: $3^{\circ} 21'$ W. July 4, 1898. Mean annual change, $+ 03.5'$.

FAYETTEVILLE, FAYETTE COUNTY.

Location of station: On Maple avenue, on south side of street, between First and Second alleys.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is a bronze tablet. Reference marks: Southeast corner of Trimble's livery stable, N. 80° W., 125.4 feet distant; corner of Maple avenue and Second alley, S. 80° E., 128.6 feet distant; northeast corner of Journal printing office, S. 58° W., 206 feet distant.

Distant mark: North of station, 428 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, in north side of lot owned by Mr. J. F. White, near fence line and about 50 feet east of old fort. Aluminum bolt in center of top of post. Reference marks: Northeast corner of lot, N. 30° E., 21.8 feet distant; northwest corner of carriage house, S. 25° E., 54.6 feet distant; north fence of lot is 2 feet north of post.

Resident referee: Mr. J. T. Grose, county clerk.

Magnetic declination: $1^{\circ} 28'$ W. November 8, 1898, at 10 a. m. Mean annual change, $+ 03.5'$.

FRANKLIN, PENDLETON COUNTY.

Location of station: East of town about 800 feet, in south part of meadow owned by W. H. Boggs.

Station mark: A limestone post, 44 by 7 by 7 inches, set 38 inches in the ground, in the center of top of which is a bronze tablet. Reference marks: Southeast corner of field, S. 10° E., 6 feet distant; apple tree, N. 86° E., 24.5 feet distant; locust tree, 7 inches in diameter, N. 8° W., 308 feet distant.

Distant mark: North of station, 419 feet. A limestone post, 44 by 7 by 7 inches, set 36 inches in the ground, in north part of meadow above referred to. Aluminum bolt in center of top of post. Reference marks: Locust tree, S. 20° W., 121 feet distant; where fence joins alley, N. 69° W., 262 feet distant.

Resident referee: Mr. I. E. Bolton, county clerk.

Magnetic declination: $2^{\circ} 45'$ W. June 18, 1898. Mean annual change, $+ 03.5'$.

GLENVILLE, GILMER COUNTY.

Location of station: In normal school grounds, 26.8 feet southeast of southeast corner of school building.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Southeast corner of building, N. 40° W., 26.8 feet distant; southwest corner of building, N. 83° W., 49.8 feet distant; apple tree, 8 inches in diameter, N. 10° E., 95 feet distant.

Distant mark: North of station, 304 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground owned by George E. Linn, on fence line 14 feet west of the northeast corner of the normal school grounds. Aluminum bolt in center of top of post. Reference marks: Oak tree, 22 inches in diameter, S. 80° E., 22 feet distant; apple tree, 5 inches in diameter, N. 22° E., 36 feet distant; northeast corner of building, S. 33° W., 105 feet distant.

Resident referee: Mr. J. N. Kee, county clerk.

Magnetic declination: $2^{\circ} 8'$ W. July 17, 1898, at 10 a. m. Mean annual change, $+ 03.5'$.

GRAFTON, TAYLOR COUNTY.

Location of station: Thirteen feet east of the northeast corner of St. Johns and Emory streets, near middle of where sidewalk will be.

Station mark: A marble post, 44 by 8 by 8 inches, set 38 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 6 inches in diameter, N. 10° W., 22 feet distant; middle of water tower, S. 41° W., 394 feet distant.

Distant mark: North of station, 1,061 feet. A marble post, 30 by 8 by 8 inches, set 30 inches in the ground on north side of a barnyard, 3 feet south of line of fence. Aluminum bolt in center of top of post. Reference marks: Sycamore tree, 8 inches in diameter, N. 58° W., 24.3 feet distant; walnut tree, 16 inches in diameter, S. 46° E., 169 feet distant.

Resident referee: Mr. F. J. Burdette, county clerk.

Magnetic declination: $3^{\circ} 38'$ W. June 23, 1898. Mean annual change, $+03.5'$.

GRANTSVILLE, CALHOUN COUNTY.

Location of station: In ground owned by Mr. J. G. S. Smith; south of Baptist Church on a steep hillside.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 30 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Walnut tree, 14 inches in diameter, N. 74° E., 149 feet distant; walnut tree, 5 inches in diameter, N. 22° W., 48 feet distant; beech tree, 12 inches in diameter, S. 40° W., 148.6 feet distant.

Distant mark: North of station, 370 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in ground on fence line 9 feet south of southwest corner of Baptist church. Aluminum bolt in center of top of post. Reference marks: Southeast corner of Baptist church, N. 40° E., 48 feet distant; southwest corner of Baptist church, N. 65° W., 19.5 feet distant; walnut tree, 12 inches in diameter, S. 55° W., 112 feet distant.

Resident referee: Mr. L. H. Trippett, county clerk.

Magnetic declination: $1^{\circ} 15'$ W. July 22, 1898, at 10 a. m. Mean annual change, $+03.5'$.

HAMLIN, LINCOLN COUNTY.

Location of station: On Main street, opposite James Brown's house.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southeast corner of H. Eaststep's house, N. 46° W., 78.2 feet distant; northwest corner of James Brown's house, N. 80° E., 39 feet distant; southwest corner of James Brown's house, S. 30° E., 42 feet distant.

Distant mark: North of station, 304 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, opposite Dr. Thacker's house and near his porch. Aluminum bolt in center of top of post. Reference marks: Southeast corner of Dr. Thacker's house, N. 65° W., 6 feet distant; southwest corner of Dr. Thacker's porch, N. 50° E., 9.5 feet distant.

Resident referee: Mr. Robert Hager, county clerk.

Magnetic declination: $1^{\circ} 32'$ W. November 15, 1898, at 9.40 a. m. Mean annual change: $+03.5'$.

HARRISVILLE, BITCHIE COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On John Holderman's farm, about $\frac{3}{4}$ mile south of the court-house. The station is on a ridge just above a farmhouse and about 800 feet from it; near the lands of Dr. W. E. Talbot and Mr. E. C. Fox.

Station mark: A heavy sandstone post which projects above the ground, in the center of top of which is a copper bolt.

Distant mark: North of station about 1 mile. A sandstone post similar to the station mark, in the center of top of which is a copper bolt.

Resident referee: John W. Cain, surveyor.

HINTON, SUMMERS COUNTY.

Location of station: In southeast corner of public square.

Station mark: A post of Ohio limestone, 42 by 8 by 7 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 6 inches in diameter, N. 27° E., 57.7 feet distant; maple tree, 4 inches in diameter, S. 64° W., 66.3 feet distant; northwest corner of Second avenue and James street, N. 83° E., 62 feet distant.

Distant mark: North of station, 307.3 feet. A post of Ohio limestone, 36 by 8 by 7 inches, set 36 inches in the ground, opposite front door of Graham's store, on south side of north sidewalk, 10 feet east of Second avenue. Aluminum bolt in center of top of post. Reference marks: Southeast corner of Graham's store, N. 45° W., 10.4 feet distant; maple tree, 5 inches in diameter, due east, 18 feet distant.

Resident referee: Mr. J. M. Lavender, city engineer.

Magnetic declination: $1^{\circ} 22'$ W. October 20, 1898, at 9.40 a.m. Mean annual change, $+03.5'$.

HUNTINGTON, CABELL COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: Near southwest corner of new, unfinished school building, situated on southeast corner of Fifth avenue and Sixth street.

Station mark: A freestone buried with top 2 feet below surface of ground, in center of top of which is a copper bolt.

Distant mark: South of station, about 1,000 feet, in a field beyond which is an orchard. This mark is similar to the station mark.

Resident referee: Mr. J. H. Sandbord, city engineer and surveyor, witnessed the setting of both marks.

KEYSER, MINERAL COUNTY.

Location of station: On southeast side of field, near public road, and 3 feet west of east fence.

Station mark: A marble post, 44 by 7 by 7 inches, set 38 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: An elm tree 26 inches in diameter, S. 29° W., 166 feet distant; cupola on schoolhouse, N. 16° E.; pinnacle, S. 55° W.

Distant mark: North of station, 1,040.3 feet. A marble post, 36 by 7 by 7 inches, set 36 inches in the ground, near the northwest corner of field near intersection of street and alley and 3 feet east of street fence. Aluminum bolt in center of top of post. Reference marks: Southeast corner of yard on alley, N. 64° W., 49 feet distant; southwest corner of yard, N. 32° E., 20 feet distant.

Resident referee: Mr. J. V. Bell, county clerk.

Magnetic declination: 3° 57'. June 21, 1898. Mean annual change, + 03.5'.

KINGWOOD, PRESTON COUNTY.

Location of station: South of livery stable, on Mr. McBue's land, 3 feet north of south fence.

Station mark: A granite post, 44 by 8 by 8 inches, set 39 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Apple tree 8 inches in diameter, N. 55° W., 46.5 feet distant; apple tree 8 inches in diameter, N. 47° E., 45 feet distant; church spire, N. 34° 30' W.; another church spire, N. 8° 30' E.

Distant mark: North of station, 467.5 feet. A granite post, 36 by 8 by 8 inches, set 36 inches in the ground in hotel yard, near southwest corner of bowling alley. Aluminum bolt in center of top of post. Reference marks: Southwest corner of bowling alley, due north, 4.4 feet distant; northwest corner of outhouse, S. 30° E., 16 feet distant; northeast corner of bay window of hotel, N. 30° W., 138 feet distant.

Resident referee: Mr. George A. Wells, county clerk.

Magnetic declination: 3° 39' W. June 26, 1898. Mean annual change, + 03.5'.

LEWISBURG, GREENBRIER COUNTY.

Location of station: In the grounds of Major Lee's military academy, east of main building.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is a bronze tablet. Reference marks: An oak tree 30 inches in diameter, due south, 12.1 feet distant; northeast corner of school building, S. 75° W., 76 feet distant; cherry tree 8 inches in diameter, N. 78° W., 90.8 feet distant.

Distant mark: North of station, 323 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground in northeast corner of school yard. Aluminum bolt in center of top of post. Reference marks: Maple tree 18 inches in diameter, S. 75° W., 65.3 feet distant; frame house, N. 10° E., 162 feet distant. It is 6 feet west of corner post.

Resident referee: Mr. Charles B. Buster, county clerk.

Magnetic declination: 1° 41' W. October 22, 1898, at 10 a. m. Mean annual change, + 03.5'.

LOGAN, LOGAN COUNTY.

Location of station: In court-house grounds, 8 feet east of northeast corner of court-house.

Station mark: A red sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of court-house, N. 85° W., 8 feet distant; locust tree 5 inches in diameter, S. 5° E., 18 feet distant; locust tree 6 inches in diameter, N. 10° E., 39 feet distant.

Distant mark: North of station, 712 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 5 feet east of east fence of cemetery. Aluminum bolt in center of top of post. Reference marks: Walnut tree 18 inches in diameter, S. 14° W., 180.8 feet distant; elm tree 14 inches in diameter, S. 85° W., 97.8 feet distant; cherry tree 24 inches in diameter, in cemetery, S. 75° W., 84.5 feet distant.

Resident referee: Mr. S. S. Altizer, county clerk.

Magnetic declination: $1^{\circ} 31'$ W. August 31, 1898, at 11 a. m. Mean annual change, + $03.5'$.

MADISON, BOONE COUNTY.

Location of station: On hillside northeast of Methodist Church, on land owned by Mr. Thompson.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Cherry tree 2 inches in diameter, N. 80° E., 96 feet distant; hickory tree 11 inches in diameter, S. 73° E., 148 feet distant; northeast corner of Methodist Episcopal church, S. 85° W., 315 feet distant.

Distant mark: North of station, 337.8 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 1 foot south of south fence around St. Clair Hotel. Aluminum bolt in center of top of post. Reference marks: Northeast corner of Methodist Episcopal church, S. 40° W., 520.7 feet distant; southwest corner of St. Clair Hotel, N. 10° E., 93.6 feet distant; southeast corner of Leftwitch's house, N. 70° W., 91.8 feet distant.

Resident referee: Mr. J. M. Hupton, county clerk.

Magnetic declination: $2^{\circ} 11'$ W. August 29, 1898, at 9 a. m. Mean annual change, + $03.5'$.

MARLINTON, POCAHONTAS COUNTY.

Location of station: In court-house grounds, 11.9 feet northeast of court-house steps.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is a bronze tablet. Reference marks: Northeast corner of court-house steps, N. 82° W., 11.9 feet distant; northeast corner of court-house, N. 80° E., 11 feet distant; a small elm tree 3 inches in diameter, N. 55° W., 37 feet distant.

Distant mark: North of station, 957.6 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, on south side of mountain owned by Pocahontas Improvement Company. Aluminum bolt in center of top of post. Reference marks: Northwest corner of Uriah Bird's store, S. 3° E., 86 feet distant; chestnut tree 18 inches in diameter, S. 36° W., 40.4 feet distant; a small chestnut tree 3 inches in diameter, S. 84° E., 30 feet distant.

Resident referee: Mr. S. L. Brown, county clerk.

Magnetic declination: $3^{\circ} 31'$ W. August 16, 1898, at 11.20 a. m. Mean annual change, $+03.5'$.

MARTINSBURG, BERKELEY COUNTY.

Location of station: At head of principal driveway of cemetery and 13 feet west of walk.

Station mark: A marble post, 40 by 8 by 6 inches, set 32 inches in the ground, in the center of top of which is a bronze tablet.

Distant mark: North of station, 515 feet. A marble post, 40 by 8 by 6 inches, set 32 inches in the ground, 30 feet east of the entrance gate and 4 feet from the fence. Aluminum bolt in the center of top of post.

Resident referee: Mr. J. L. Bender, county clerk.

Magnetic declination: $4^{\circ} 27'$ W. May 27, 1898. Mean annual change, $+03.5'$.

MIDDLEBOURNE, TYLER COUNTY.

Location of station: In fair grounds, southeast of grand stand and near south fence.

Station mark: A sandstone post, 42 by 10 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree 4 inches in diameter, N. 84° E., 46 feet distant; southwest corner of floral building, N. 32° E., 218.3 feet distant; southeast corner of grand stand, N. 22° W., 128 feet distant.

Distant mark: North of station, 322 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, near the north fence of fair grounds and northeast of grand stand. Aluminum bolt in center of top of post. Reference marks: Northwest corner of floral building, S. 30° E., 137 feet distant; northeast corner of grand stand, S. 18° W., 133.5 feet distant.

Resident referee: Mr. D. Hickman, county clerk.

Magnetic declination: $1^{\circ} 36'$ W. December 3, 1898, at 10.45 a. m. Mean annual change, $+04'$.

MOOREFIELD, HARDY COUNTY.

Location of station: About one-half mile east of town on top of hill on land owned by Mr. J. W. Gilkeson. On line of fence which bears N. 14° E., and S. 14° W.

Station mark: A marble post, 44 by 7 by 7 inches, set 37 inches in the

ground, in the center of top of which is cemented a bronze tablet. Reference marks: Oak tree 18 inches in diameter, N. 54° W., 450 feet distant; oak tree 8 inches in diameter, S. 3° E., 160 feet distant.

Distant mark: North of station, 826 feet. A marble post, 33 by 7 by 7 inches, set 30 inches in the ground, 3 feet south of south fence of cemetery. Aluminum bolt in center of top of post. Reference marks: Monument to G. P. Williams, N. 60° E., 26.5 feet distant; monument to J. R. Heiskill, N. 10° E., 16.5 feet distant.

Resident referee: Mr. C. Wilton, county clerk.

Magnetic declination: $3^{\circ} 37'$ W. June 12, 1898. Mean annual change, $+03.5'$.

MORGANTOWN, MONONGALIA COUNTY.

Location of station: South side of State University Park, 11 feet north of south fence.

Station mark: A marble post, 44 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree 14 inches in diameter, N. 75° E., 59 feet distant; sycamore tree 25 inches in diameter, N. 35° W., 236 feet distant; small frame house, S. 45° W., 16 feet distant; small frame house, S. 55° E., 25 feet distant.

Distant mark: North of station, 460 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground in University Park. Aluminum bolt in center of top of post. Reference marks: Northwest corner of law building, due east, 60 feet distant; pine tree 8 inches in diameter, N. 10° W., 20 feet distant.

Resident referee: Mr. John E. Price, county clerk.

Magnetic declination: $3^{\circ} 21'$ W. June 30, 1898. Mean annual change, $+03.5'$.

MOUNDSVILLE, MARSHALL COUNTY.

Location of station: Northeast corner Eighth and Tomlinson streets, along curb line, 80 feet southwest of corner of public school building, about 200 feet north of Great Mound.

Station mark: A post of Ohio sandstone, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: To southwest corner of school building, 80.3 feet; northeast corner Eighth and Tomlinson streets, 12.8 feet distant; northwest corner of same, 38.1 feet distant; southwest corner of same, 64.6 feet distant.

Distant mark: North of station, 959.2 feet distant. A sandstone post similar to station mark, set in the ground near the northwest corner of Sixth and Tomlinson streets. Aluminum bolt in the center of top of post. Reference marks: Northeast corner Sixth and Tomlinson streets, 55.6 feet distant; southeast corner of W. D. Alexander's house, 40.9 feet distant; maple tree, 2 feet in diameter, due north, 9.2 feet distant.

Resident referee: Mr. E. M. Lewis, county clerk.

Magnetic declination: $1^{\circ} 07'$ W. December 10, 1898, at 10.30 a. m.
Mean annual change, $+03.5'$.

NEW CUMBERLAND, HANCOCK COUNTY.

Location of station: In back part of public school grounds.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.
Reference marks: Southeast corner of schoolhouse chimney, N. 65° W., 16.5 feet distant; southwest corner of schoolhouse chimney, N. 73° W., 20.8 feet distant; southeast corner of schoolhouse, S. 33° W., 19.6 feet distant.

Distant mark: North of station, 631.5 feet. A sandstone post, 36 by 10 by 10 inches, set 36 inches in the ground, at the southeast corner of blacksmith shop on highway north of schoolhouse. Aluminum bolt in center of top of post. Reference marks: Southeast corner of blacksmith shop, 2.3 feet distant; southwest corner of blacksmith shop, 13 feet distant.

Resident referee: Clerk of circuit court.

Magnetic declination: $1^{\circ} 38'$ W. December 15, 1898, at 3 p. m.
Mean annual change, $+04'$.

NEW MARTINSVILLE, WETZEL COUNTY.

Location of station: Inside the race course of the fair grounds.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.
Reference marks: Locust tree, 18 inches in diameter, N. 85° W., 319.5 feet distant; southeast corner of judge's stand, N. 45° W., 288.9 feet distant; northeast corner of floral hall, S. 12° W., 137.6 feet distant.

Distant mark: North of station, 971 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, inside of the race course of fair grounds near the north end. Aluminum bolt in the center of top of post. Reference marks: Northwest corner of fair grounds, N. 38° W., 241.3 feet distant; apple tree, 24 inches in diameter, N. 55° E., 149 feet distant.

Resident referee: Mr. H. R. Thompson, county clerk.

Magnetic declination: $0^{\circ} 59'$ W. December 8, 1898, at 10 a. m.
Mean annual change, $+04'$.

OCEANA, WYOMING COUNTY.

Location of station: On hillside south of town, on land owned by Mrs. M. A. Conley.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.
Reference marks: Apple tree 8 inches in diameter, N. 61° W., 31.9 feet distant; chestnut tree 24 inches in diameter, N. 85° E., 164 feet distant;

chestnut tree 30 inches in diameter, S. 33° E., 127.2 feet distant; chestnut tree 26 inches in diameter, S. 11° W., 136.2 feet distant.

Distant mark: North of station, 1,430.4 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on hillside north of town, in land owned by G. and B. H. Chambers, heirs of L. B. Chambers. Aluminium bolt in center of top of post. Reference marks: Oak tree 18 inches in diameter, N. 21° W., 127 feet distant; chestnut tree 22 inches in diameter, N. 73° E., 147.8 feet distant; flag pole on Kelly Hotel, S. 7° W.

Resident referee: Mr. T. W. Cook, county clerk.

Magnetic declination: $1^{\circ} 37'$ W., October 5, 1898, at 10.30 a. m.

Mean annual change, $+ 03.5'$.

PARKERSBURG, WOOD COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: In City Park.

Station mark: A sandstone post, 41 by 11.5 by 11.5 inches, set 36 inches in the ground. Copper bolt in center of top of post.

Distant mark: South of station, 697 feet. Near the house of the park keeper. Post similar to that at North station, with copper bolt in center of top.

PARSONS, TUCKER COUNTY.

Location of station: In a large vacant lot owned by the West Virginia Central and Pittsburg Railroad Company, east of and opposite to the depot.

Station mark: A sandstone post, 44 by 8 by 8 inches, set 38 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Railroad station, N. 35° W., 520 feet distant; cherry tree 6 inches in diameter, S. 10° E., 49 feet distant; maple tree 8 inches in diameter, S. 5° W., 10 feet distant.

Distant mark: North of station, 651 feet. A sandstone post, similar to station mark, set 36 inches in ground on railroad company's lot, 5 feet south of fence line which parallels railroad. Aluminium bolt in center of top of post. Reference marks: Railroad station, S. 15° W., 330 feet distant.

Resident referee: Mr. William M. Cayton, county clerk.

Magnetic declination: $3^{\circ} 22'$ W., July 7, 1898, at 11 a. m. Mean annual change, $+ 03.5'$.

PETERSBURG, GRANT COUNTY.

Location of station: Northwest corner of court-house yard, 821 feet north of east-and-west line of fence.

Station mark: A sandstone post, 44 by 10 by 7 inches, set 40 inches in the ground, in the center of top of which is cemented a bronze tablet.

Reference marks: Northwest corner of main building of court-house, S. 86° E., 62 feet distant; northwest corner of wing to court-house, S. 18° E., 51 feet distant; southwest corner of wing to court-house, S. 40° E., 70 feet distant.

Distant mark: North of station, 821 feet. A sandstone post, 28 by 8 by 8 inches, set 28 inches in the ground, near an east-and-west line of fence. Aluminium bolt in center of top of post. Reference marks: Line fence 3 feet north; water-oak tree 7 inches in diameter, S. 80° E., 178 feet distant.

Resident referee: Mr. D. P. Hendrickson, county clerk.

Magnetic declination: $3^{\circ} 37'$ W., June 14, 1898. Mean annual change, $+ 03.5'$.

PHILIPPI, BARBOUR COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: In southern part of town on a street running nearly east and west, on land owned by Mr. C. A. W. Smith; in third lot west of Main street.

Station mark: Heavy sandstone post, in the center of top of which is a copper bolt.

Distant mark: South of station, about 2,000 feet, in northwest corner of lot owned by Hon. G. A. Dayton. This mark is similar to one at north station.

Resident referee: Mr. T. L. O'Neal, county surveyor.

POINT PLEASANT, MASON COUNTY.

Location of station: In the grounds of the high school.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southeast corner of school building, N. 46° W., 125.2 feet distant; northeast corner of school building, N. 23° W., 179.5 feet distant; northeast corner of school grounds, N. 15° E., 180.5 feet distant.

Distant mark: North of station, 337.6 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, in the jail yard. Aluminium bolt in center of top of post. Reference marks: Northwest corner of jail, N. 80° E., 25.8 feet distant; southwest corner of jail, S. 10° W., 61.6 feet distant.

Resident referee: Mr. J. P. R. B. Smith, county clerk.

Magnetic declination: $1^{\circ} 21'$ W., November 21, 1898, at 10 a. m. Mean annual change, $+ 04'$.

PRINCETON, MERCER COUNTY.

Location of station: In high-school grounds, 3.5 feet north of fence.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.

Reference marks: Southeast corner of high-school building, N. 38° W., 223.5 feet distant; maple tree 4 inches in diameter, N. 45° E., 140.9 feet distant; southeast corner of high-school grounds, east, 70.8 feet distant.

Distant mark: North of station, 385 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, 3.4 feet south of the north fence of the high-school grounds. Aluminium bolt in center of top of post. Reference marks: Pine tree 24 inches in diameter, S. 10° W., 38 feet distant; oak tree 5 inches in diameter, S. 10° E., 33 feet distant.

Resident referee: Mr. A. J. Hearn, county clerk.

Magnetic declination: $1^{\circ} 33'$ W., October 28, 1898, at 11 a. m. Mean annual change, $+ 03.5'$.

RIPLEY, JACKSON COUNTY.

Location of station: In southwest corner of court-house grounds.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in southwest corner of court-house grounds, in center of top of which is cemented a bronze tablet. Reference marks: Southeast corner of Hassler's Hotel, S. 73° W., 111.3 feet distant; southwest corner of clerk's office, N. 74° E., 158.8 feet distant; southwest corner of court-house, N. 44° E., 194.2 feet distant.

Distant mark: North of station, 334.5 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, near northwest corner of court-house grounds. Aluminium bolt in center of top of post. Reference marks: Northwest corner of court-house, S. 42° W., 224.2 feet distant; Mr. J. M. Wright's house, north, 46 feet distant.

Resident referee: Mr. G. B. Crow, county clerk.

Magnetic declination: $1^{\circ} 25'$ W., November 25, 1898, at 10.30 a. m. Mean annual change, $+ 04'$.

ROMNEY, HAMPSHIRE COUNTY.

Location of station: In the grounds of the institution for deaf, dumb, and blind, north of the main building, in southeast corner of the baseball grounds.

Station mark: A marble post, 42 by 7 by 7 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of east brick building, S. 52° E., 92 feet distant; northwest corner of east brick building, S. 34° E., 45.5 feet distant; northeast corner of west brick building, S. 11° W., 39.5 feet distant; northwest corner of west brick building, S. 67° W., 54 feet distant.

Distant mark: North of station, 645 feet. A limestone post, 30 by 10 by 6 inches, set 28 inches in the ground, on line of fence, 21 feet east of fence running north. Aluminum bolt in center of top of post.

Resident referee: Mr. C. S. White, county clerk.

Magnetic declination: $2^{\circ} 46'$ W. June 10, 1898. Mean annual change, $+ 03.5'$.

SAINT MARYS, PLEASANTS COUNTY.

Location of station: In the court-house yard, in front of main entrance to court-house.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northwest corner of court-house, S. 11° W., 55.8 feet distant; northeast corner of court-house, N. 40° E., 76 feet distant.

Distant mark: North of station, 480 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on street corner north of court-house. Aluminum bolt in center of top of post. Reference marks: Northwest corner of street, 13.4 feet distant; northeast corner of street, 68.3 feet distant; southwest corner of street, 58.5 feet distant.

Resident referee: Mr. W. C. Dotson, county clerk.

Magnetic declination: $1^{\circ} 04'$ W. November 30, 1898, at 10.30 a. m. Mean annual change, $+ 04'$.

SPENCER, ROANE COUNTY.

Location of station: In grounds of State Hospital for the Insane, 45.5 feet east of main entrance to main building.

Station mark: A blue sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of main door, S. 70° W., 45.5 feet distant; northeast corner of corridor, S. 40° W., 21 feet distant; northwest corner of east wing, S. 50° E., 37 feet distant; chimney of power house, N. 28° W.

Distant mark: North of station, 302 feet. A blue sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 131 feet northeast of power house. Aluminum bolt in center of top of post. Reference marks: Northeast corner of hospital, S. 85° E., 321 feet distant; southwest corner of power house, S. 70° W., 131 feet distant; southeast corner of power house, N. 75° W., 81 feet distant.

Resident referee: Mr. M. F. Lewellen, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. July 28, 1898, at 10.30 a. m.

SUMMERSVILLE, NICHOLAS COUNTY.

Location of station: In public school grounds, 10 feet north of south fence.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 3 inches in diameter, due west, 15.6 feet distant; wild cherry tree, 26 inches in diameter, N. 64° E., 217.5 feet distant; southwest corner of schoolhouse, N. 78° E., 287.2 feet distant.

Distant mark: North of station, 851.5 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, near fence line, in land owned by A. Muerin. Aluminum bolt in center of top of post. Refer-

ence marks: Locust tree, 8 inches in diameter, N. 55° W., 119.5 feet distant; locust tree, 13 inches in diameter, N. 14° E., 152.7 feet distant; cherry tree, 7 inches in diameter, S. 57° W., 47 feet distant.

Resident referee: Mr. J. A. Hamilton, county clerk.

Magnetic declination: $3^{\circ} 14'$ W. August 25, 1898, at 9.45 a. m.

Mean annual change, $+ 03.5'$.

SUTTON, BRAXTON COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On east side of Main street, at corner of the first street north of the Bluff in Upper Sutton.

Station mark: A sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station, 843.2 feet. On east side of Main street, and is on the north side of the second street north of the station. Mark is similar to that at the south.

Resident referees: Mr. John B. Dunlop and Mr. James A. Johnson, surveyors, assisted in setting the posts.

UNION, MONROE COUNTY.

Location of station: On west side of Main street, opposite post-office.

Station mark: A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of Mrs. M. Dunlap's house, S. 45° W., 40.8 feet distant; southwest corner of post-office, N. 65° E., 66.6 feet distant; southwest corner of court-house, N. 30° E., 155.7 feet distant.

Distant mark: North of station, 634.7 feet. A limestone post, 36 by 8 by 8 inches, set 36 inches in the ground, on the east side of Main street, north of the corner of Bryan and Main streets. Aluminum bolt in center of top of post. Reference marks: Sycamore tree, 24 inches in diameter, S. 62° W., 62.7 feet distant; white house on southeast corner of Bryan and Main streets, S. 75° W., 33.5 feet distant.

Resident referee: Mr. J. M. McClaugherty, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. October 25, 1898, at 10.30 a. m.

Mean annual change, $+ 03.5'$.

WAYNE, WAYNE COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On hill east of Wayne, on property belonging to Prof. J. B. McClure, and in the lot east of and above his school.

Station mark: A sandstone post about 1 foot square, and buried in the ground so that 8 inches project above surface, in the center of top of which is a copper bolt.

SAINT MARYS, PLEASANTS COUNTY.

Location of station: In the court-house yard, in front of main entrance to court-house.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northwest corner of court-house, S. 11° W., 55.8 feet distant; northeast corner of court-house, N. 40° E., 76 feet distant.

Distant mark: North of station, 480 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on street corner north of court-house. Aluminum bolt in center of top of post. Reference marks: Northwest corner of street, 13.4 feet distant; northeast corner of street, 68.3 feet distant; southwest corner of street, 58.5 feet distant.

Resident referee: Mr. W. C. Dotson, county clerk.

Magnetic declination: $1^{\circ} 04'$ W. November 30, 1898, at 10.30 a. m.
Mean annual change, $+ 04'$.

SPENCER, ROANE COUNTY.

Location of station: In grounds of State Hospital for the Insane, 45.5 feet east of main entrance to main building.

Station mark: A blue sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of main door, S. 70° W., 45.5 feet distant; northeast corner of corridor, S. 40° W., 21 feet distant; northwest corner of east wing, S. 50° E., 37 feet distant; chimney of power house, N. 28° W.

Distant mark: North of station, 302 feet. A blue sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 131 feet northeast of power house. Aluminum bolt in center of top of post. Reference marks: Northeast corner of hospital, S. 85° E., 321 feet distant; southwest corner of power house, S. 70° W., 131 feet distant; southeast corner of power house, N. 75° W., 81 feet distant.

Resident referee: Mr. M. F. Lewellen, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. July 28, 1898, at 10.30 a. m.

SUMMERSVILLE, NICHOLAS COUNTY.

Location of station: In public school grounds, 10 feet north of south fence.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 3 inches in diameter, due west, 15.6 feet distant; wild cherry tree, 26 inches in diameter, N. 64° E., 217.5 feet distant; southwest corner of schoolhouse, N. 78° E., 287.2 feet distant.

Distant mark: North of station, 851.5 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, near fence line, in land owned by A. Muerin. Aluminum bolt in center of top of post. Refer-

ence marks: Locust tree, 8 inches in diameter, N. 55° W., 119.5 feet distant; locust tree, 13 inches in diameter, N. 14° E., 152.7 feet distant; cherry tree, 7 inches in diameter, S. 57° W., 47 feet distant.

Resident referee: Mr. J. A. Hamilton, county clerk.

Magnetic declination: $3^{\circ} 14'$ W. August 25, 1898, at 9.45 a. m.
Mean annual change, $+ 03.5'$.

SUTTON, BRAXTON COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On east side of Main street, at corner of the first street north of the Bluff in Upper Sutton.

Station mark: A sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station, 843.2 feet. On east side of Main street, and is on the north side of the second street north of the station. Mark is similar to that at the south.

Resident referees: Mr. John B. Dunlop and Mr. James A. Johnson, surveyors, assisted in setting the posts.

UNION, MONROE COUNTY.

Location of station: On west side of Main street, opposite post-office.

Station mark: A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of Mrs. M. Dunlap's house, S. 45° W., 40.8 feet distant; southwest corner of post-office, N. 65° E., 66.6 feet distant; southwest corner of court-house, N. 30° E., 155.7 feet distant.

Distant mark: North of station, 634.7 feet. A limestone post, 36 by 8 by 8 inches, set 36 inches in the ground, on the east side of Main street, north of the corner of Bryan and Main streets. Aluminum bolt in center of top of post. Reference marks: Sycamore tree, 24 inches in diameter, S. 62° W., 62.7 feet distant; white house on southeast corner of Bryan and Main streets, S. 75° W., 33.5 feet distant.

Resident referee: Mr. J. M. McClaugherty, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. October 25, 1898, at 10.30 a. m.
Mean annual change, $+ 03.5'$.

WAYNE, WAYNE COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On hill east of Wayne, on property belonging to Prof. J. B. McClure, and in the lot east of and above his school.

Station mark: A sandstone post about 1 foot square, and buried in the ground so that 8 inches project above surface, in the center of top of which is a copper bolt.

SAINT MARYS, PLEASANTS COUNTY.

Location of station: In the court-house yard, in front of main entrance to court-house.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northwest corner of court-house, S. 11° W., 55.8 feet distant; northeast corner of court-house, N. 40° E., 76 feet distant.

Distant mark: North of station, 480 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on street corner north of court-house. Aluminum bolt in center of top of post. Reference marks: Northwest corner of street, 13.4 feet distant; northeast corner of street, 68.3 feet distant; southwest corner of street, 58.5 feet distant.

Resident referee: Mr. W. C. Dotson, county clerk.

Magnetic declination: $1^{\circ} 04'$ W. November 30, 1898, at 10.30 a. m. Mean annual change, $+ 04'$.

SPENCER, ROANE COUNTY.

Location of station: In grounds of State Hospital for the Insane, 45.5 feet east of main entrance to main building.

Station mark: A blue sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of main door, S. 70° W., 45.5 feet distant; northeast corner of corridor, S. 40° W., 21 feet distant; northwest corner of east wing, S. 50° E., 37 feet distant; chimney of power house, N. 28° W.

Distant mark: North of station, 302 feet. A blue sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 131 feet northeast of power house. Aluminum bolt in center of top of post. Reference marks: Northeast corner of hospital, S. 85° E., 321 feet distant; southwest corner of power house, S. 70° W., 131 feet distant; southeast corner of power house, N. 75° W., 81 feet distant.

Resident referee: Mr. M. F. Lewellen, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. July 28, 1898, at 10.30 a. m.

SUMMERSVILLE, NICHOLAS COUNTY.

Location of station: In public school grounds, 10 feet north of south fence.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 3 inches in diameter, due west, 15.6 feet distant; wild cherry tree, 26 inches in diameter, N. 64° E., 217.5 feet distant; southwest corner of schoolhouse, N. 78° E., 287.2 feet distant.

Distant mark: North of station, 851.5 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, near fence line, in land owned by A. Muerin. Aluminum bolt in center of top of post. Refer-

ence marks: Locust tree, 8 inches in diameter, N. 55° W., 119.5 feet distant; locust tree, 13 inches in diameter, N. 14° E., 152.7 feet distant; cherry tree, 7 inches in diameter, S. 57° W., 47 feet distant.

Resident referee: Mr. J. A. Hamilton, county clerk.

Magnetic declination: $3^{\circ} 14'$ W. August 25, 1898, at 9.45 a. m.
Mean annual change, $+03.5'$.

SUTTON, BRAXTON COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On east side of Main street, at corner of the first street north of the Bluff in Upper Sutton.

Station mark: A sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station, 843.2 feet. On east side of Main street, and is on the north side of the second street north of the station. Mark is similar to that at the south.

Resident referees: Mr. John B. Dunlop and Mr. James A. Johnson, surveyors, assisted in setting the posts.

UNION, MONROE COUNTY.

Location of station: On west side of Main street, opposite post-office.

Station mark: A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of Mrs. M. Dunlap's house, S. 45° W., 40.8 feet distant; southwest corner of post-office, N. 65° E., 66.6 feet distant; southwest corner of court-house, N. 30° E., 155.7 feet distant.

Distant mark: North of station, 634.7 feet. A limestone post, 36 by 8 by 8 inches, set 36 inches in the ground, on the east side of Main street, north of the corner of Bryan and Main streets. Aluminum bolt in center of top of post. Reference marks: Sycamore tree, 24 inches in diameter, S. 62° W., 62.7 feet distant; white house on southeast corner of Bryan and Main streets, S. 75° W., 33.5 feet distant.

Resident referee: Mr. J. M. McClaugherty, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. October 25, 1898, at 10.30 a. m.
Mean annual change, $+03.5'$.

WAYNE, WAYNE COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On hill east of Wayne, on property belonging to Prof. J. B. McClure, and in the lot east of and above his school.

Station mark: A sandstone post about 1 foot square, and buried in the ground so that 8 inches project above surface, in the center of top of which is a copper bolt.

SAINT MARYS, PLEASANTS COUNTY.

Location of station: In the court-house yard, in front of main entrance to court-house.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northwest corner of court-house, S. 11° W., 55.8 feet distant; northeast corner of court-house, N. 40° E., 76 feet distant.

Distant mark: North of station, 480 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on street corner north of court-house. Aluminum bolt in center of top of post. Reference marks: Northwest corner of street, 13.4 feet distant; northeast corner of street, 68.3 feet distant; southwest corner of street, 58.5 feet distant.

Resident referee: Mr. W. C. Dotson, county clerk.

Magnetic declination: $1^{\circ} 04'$ W. November 30, 1898, at 10.30 a. m. Mean annual change, $+ 04'$.

SPENCER, ROANE COUNTY.

Location of station: In grounds of State Hospital for the Insane, 45.5 feet east of main entrance to main building.

Station mark: A blue sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of main door, S. 70° W., 45.5 feet distant; northeast corner of corridor, S. 40° W., 21 feet distant; northwest corner of east wing, S. 50° E., 37 feet distant; chimney of power house, N. 28° W.

Distant mark: North of station, 302 feet. A blue sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 131 feet northeast of power house. Aluminum bolt in center of top of post. Reference marks: Northeast corner of hospital, S. 85° E., 321 feet distant; southwest corner of power house, S. 70° W., 131 feet distant; southeast corner of power house, N. 75° W., 81 feet distant.

Resident referee: Mr. M. F. Lewellen, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. July 28, 1898, at 10.30 a. m.

SUMMERSVILLE, NICHOLAS COUNTY.

Location of station: In public school grounds, 10 feet north of south fence.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 3 inches in diameter, due west, 15.6 feet distant; wild cherry tree, 26 inches in diameter, N. 64° E., 217.5 feet distant; southwest corner of schoolhouse, N. 78° E., 287.2 feet distant.

Distant mark: North of station, 851.5 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, near fence line, in land owned by A. Muerin. Aluminum bolt in center of top of post. Refer-

ence marks: Locust tree, 8 inches in diameter, N. 55° W., 119.5 feet distant; locust tree, 13 inches in diameter, N. 14° E., 152.7 feet distant; cherry tree, 7 inches in diameter, S. 57° W., 47 feet distant.

Resident referee: Mr. J. A. Hamilton, county clerk.

Magnetic declination: $3^{\circ} 14'$ W. August 25, 1898, at 9.45 a. m.

Mean annual change, $+03.5'$.

SUTTON, BRAXTON COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On east side of Main street, at corner of the first street north of the Bluff in Upper Sutton.

Station mark: A sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station, 843.2 feet. On east side of Main street, and is on the north side of the second street north of the station. Mark is similar to that at the south.

Resident referees: Mr. John B. Dunlop and Mr. James A. Johnson, surveyors, assisted in setting the posts.

UNION, MONROE COUNTY.

Location of station: On west side of Main street, opposite post-office.

Station mark: A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of Mrs. M. Dunlap's house, S. 45° W., 40.8 feet distant; southwest corner of post-office, N. 65° E., 66.6 feet distant; southwest corner of court-house, N. 30° E., 155.7 feet distant.

Distant mark: North of station, 634.7 feet. A limestone post, 36 by 8 by 8 inches, set 36 inches in the ground, on the east side of Main street, north of the corner of Bryan and Main streets. Aluminum bolt in center of top of post. Reference marks: Sycamore tree, 24 inches in diameter, S. 62° W., 62.7 feet distant; white house on southeast corner of Bryan and Main streets, S. 75° W., 33.5 feet distant.

Resident referee: Mr. J. M. McClaugherty, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. October 25, 1898, at 10.30 a. m.

Mean annual change, $+03.5'$.

WAYNE, WAYNE COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On hill east of Wayne, on property belonging to Prof. J. B. McClure, and in the lot east of and above his school.

Station mark: A sandstone post about 1 foot square, and buried in the ground so that 8 inches project above surface, in the center of top of which is a copper bolt.

SAINT MARYS, PLEASANTS COUNTY.

Location of station: In the court-house yard, in front of main entrance to court-house.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northwest corner of court-house, S. 11° W., 55.8 feet distant; northeast corner of court-house, N. 40° E., 76 feet distant.

Distant mark: North of station, 480 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on street corner north of court-house. Aluminum bolt in center of top of post. Reference marks: Northwest corner of street, 13.4 feet distant; northeast corner of street, 68.3 feet distant; southwest corner of street, 58.5 feet distant.

Resident referee: Mr. W. C. Dotson, county clerk.

Magnetic declination: $1^{\circ} 04'$ W. November 30, 1898, at 10.30 a. m. Mean annual change, $+ 04'$.

SPENCER, ROANE COUNTY.

Location of station: In grounds of State Hospital for the Insane, 45.5 feet east of main entrance to main building.

Station mark: A blue sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of main door, S. 70° W., 45.5 feet distant; northeast corner of corridor, S. 40° W., 21 feet distant; northwest corner of east wing, S. 50° E., 37 feet distant; chimney of power house, N. 28° W.

Distant mark: North of station, 302 feet. A blue sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 131 feet northeast of power house. Aluminum bolt in center of top of post. Reference marks: Northeast corner of hospital, S. 85° E., 321 feet distant; southwest corner of power house, S. 70° W., 131 feet distant; southeast corner of power house, N. 75° W., 81 feet distant.

Resident referee: Mr. M. F. Lewellen, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. July 28, 1898, at 10.30 a. m.

SUMMERSVILLE, NICHOLAS COUNTY.

Location of station: In public school grounds, 10 feet north of south fence.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 3 inches in diameter, due west, 15.6 feet distant; wild cherry tree, 26 inches in diameter, N. 64° E., 217.5 feet distant; southwest corner of schoolhouse, N. 78° E., 237.2 feet distant.

Distant mark: North of station, 851.5 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, near fence line, in land owned by A. Muerin. Aluminum bolt in center of top of post. Refer-

ence marks: Locust tree, 8 inches in diameter, N. 55° W., 119.5 feet distant; locust tree, 13 inches in diameter, N. 14° E., 152.7 feet distant; cherry tree, 7 inches in diameter, S. 57° W., 47 feet distant.

Resident referee: Mr. J. A. Hamilton, county clerk.

Magnetic declination: $3^{\circ} 14'$ W. August 25, 1898, at 9.45 a. m.
Mean annual change, $+ 03.5'$.

SUTTON, BRAXTON COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On east side of Main street, at corner of the first street north of the Bluff in Upper Sutton.

Station mark: A sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station, 843.2 feet. On east side of Main street, and is on the north side of the second street north of the station. Mark is similar to that at the south.

Resident referees: Mr. John B. Dunlop and Mr. James A. Johnson, surveyors, assisted in setting the posts.

UNION, MONROE COUNTY.

Location of station: On west side of Main street, opposite post-office.

Station mark: A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of Mrs. M. Dunlap's house, S. 45° W., 40.8 feet distant; southwest corner of post-office, N. 65° E., 66.6 feet distant; southwest corner of court-house, N. 30° E., 155.7 feet distant.

Distant mark: North of station, 634.7 feet. A limestone post, 36 by 8 by 8 inches, set 36 inches in the ground, on the east side of Main street, north of the corner of Bryan and Main streets. Aluminum bolt in center of top of post. Reference marks: Sycamore tree, 24 inches in diameter, S. 62° W., 62.7 feet distant; white house on southeast corner of Bryan and Main streets, S. 75° W., 33.5 feet distant.

Resident referee: Mr. J. M. McClaugherty, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. October 25, 1898, at 10.30 a. m.
Mean annual change, $+ 03.5'$.

WAYNE, WAYNE COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On hill east of Wayne, on property belonging to Prof. J. B. McClure, and in the lot east of and above his school.

Station mark: A sandstone post about 1 foot square, and buried in the ground so that 8 inches project above surface, in the center of top of which is a copper bolt.

SAINT MARYS, PLEASANTS COUNTY.

Location of station: In the court-house yard, in front of main entrance to court-house.

Station mark: A sandstone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northwest corner of court-house, S. 11° W., 55.8 feet distant; northeast corner of court-house, N. 40° E., 76 feet distant.

Distant mark: North of station, 480 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on street corner north of court-house. Aluminum bolt in center of top of post. Reference marks: Northwest corner of street, 13.4 feet distant; northeast corner of street, 68.3 feet distant; southwest corner of street, 58.5 feet distant.

Resident referee: Mr. W. C. Dotson, county clerk.

Magnetic declination: $1^{\circ} 04'$ W. November 30, 1898, at 10.30 a. m. Mean annual change, $+ 04'$.

SPENCER, ROANE COUNTY.

Location of station: In grounds of State Hospital for the Insane, 45.5 feet east of main entrance to main building.

Station mark: A blue sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of main door, S. 70° W., 45.5 feet distant; northeast corner of corridor, S. 40° W., 21 feet distant; northwest corner of east wing, S. 50° E., 37 feet distant; chimney of power house, N. 28° W.

Distant mark: North of station, 302 feet. A blue sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, 131 feet northeast of power house. Aluminum bolt in center of top of post. Reference marks: Northeast corner of hospital, S. 85° E., 321 feet distant; southwest corner of power house, S. 70° W., 131 feet distant; southeast corner of power house, N. 75° W., 81 feet distant.

Resident referee: Mr. M. F. Lewellen, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. July 28, 1898, at 10.30 a. m.

SUMMERSVILLE, NICHOLAS COUNTY.

Location of station: In public school grounds, 10 feet north of south fence.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Maple tree, 3 inches in diameter, due west, 15.6 feet distant; wild cherry tree, 26 inches in diameter, N. 64° E., 217.5 feet distant; southwest corner of schoolhouse, N. 78° E., 287.2 feet distant.

Distant mark: North of station, 851.5 feet. A sandstone post, 30 by 8 by 8 inches, set 30 inches in the ground, near fence line, in land owned by A. Muerin. Aluminum bolt in center of top of post. Refer-

ence marks: Locust tree, 8 inches in diameter, N. 55° W., 119.5 feet distant; locust tree, 13 inches in diameter, N. 14° E., 152.7 feet distant; cherry tree, 7 inches in diameter, S. 57° W., 47 feet distant.

Resident referee: Mr. J. A. Hamilton, county clerk.

Magnetic declination: $3^{\circ} 14'$ W. August 25, 1898, at 9.45 a. m.
Mean annual change, $+ 03.5'$.

SUTTON, BRAXTON COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On east side of Main street, at corner of the first street north of the Bluff in Upper Sutton.

Station mark: A sandstone post, in the center of top of which is a copper bolt.

Distant mark: North of station, 843.2 feet. On east side of Main street, and is on the north side of the second street north of the station. Mark is similar to that at the south.

Resident referees: Mr. John B. Dunlop and Mr. James A. Johnson, surveyors, assisted in setting the posts.

UNION, MONROE COUNTY.

Location of station: On west side of Main street, opposite post-office.

Station mark: A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of Mrs. M. Dunlap's house, S. 45° W., 40.8 feet distant; southwest corner of post-office, N. 65° E., 66.6 feet distant; southwest corner of court-house, N. 30° E., 155.7 feet distant.

Distant mark: North of station, 634.7 feet. A limestone post, 36 by 8 by 8 inches, set 36 inches in the ground, on the east side of Main street, north of the corner of Bryan and Main streets. Aluminum bolt in center of top of post. Reference marks: Sycamore tree, 24 inches in diameter, S. 62° W., 62.7 feet distant; white house on southeast corner of Bryan and Main streets, S. 75° W., 33.5 feet distant.

Resident referee: Mr. J. M. McClaugherty, county clerk.

Magnetic declination: $1^{\circ} 43''$ W. October 25, 1898, at 10.30 a. m.
Mean annual change, $+ 03.5'$.

WAYNE, WAYNE COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On hill east of Wayne, on property belonging to Prof. J. B. McClure, and in the lot east of and above his school.

Station mark: A sandstone post about 1 foot square, and buried in the ground so that 8 inches project above surface, in the center of top of which is a copper bolt.

Distant mark: South of station nearly a mile, on land owned by Mr. Burwell Ferguson; marked in a similar manner to that at the north station.

Resident referees: Mr. Joe Plymane and Mr. W. H. Atkins, surveyors.

WELCH, M'DOWELL COUNTY.

Location of station: In court-house grounds, near northeast corner of court-house and within angle formed by extension of the same.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southwest corner of jail, N. 42° E., 48.8 feet distant. Three corners are formed by the court-house and its extensions; northeast corner, 5.4 feet distant; middle corner, 14.5 feet distant; southeast corner, 33.3 feet distant.

Distant mark: North of station, 375.1 feet. A sandstone post, 38 by 8 by 8 inches, set 36 inches in the ground on hillside north of court-house; aluminum bolt in center of top of post. Reference marks: Small house, S. 40° E., 51 feet distant; small white house, S. 35° W., 126 feet distant.

Resident referee: Mr. R. B. Bernheim, county clerk.

Magnetic declination: $1^{\circ} 48'$ W. October 31, 1898, at 10.45 a. m. Mean annual change, $+03.5'$.

WELLSBURG, BROOK COUNTY.

Location of station: In southwest corner of proposed public square.

Station mark: An Ohio sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Small maple tree at southwest corner of the square, 19 feet distant; small maple tree on the west line of square, 46 feet distant; small maple tree on the west line of square, 49 feet distant; 4.9 feet north of the south line of the square and 17.5 feet east of the west line of the square.

Distant mark: North of station, 343.3 feet. A sandstone post, 44 by 8 by 8 inches, set 38 inches in the ground near curb line of proposed Seventeenth street. Aluminum bolt in center of top of post. Reference marks: West line of street, 51 feet distant; maple tree, 5 inches in diameter, S. 45° W., 67 feet distant; maple tree, 4 inches in diameter, S. 68° W., 117 feet distant.

Resident referee: Mr. G. W. McCord, county clerk.

Magnetic declination: $1^{\circ} 34'$ W. December 14, 1898, at 11.20 a. m. Mean annual change, $+01'$.

WESTON, LEWIS COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: In the grounds of the West Virginia Hospital for the Insane, in front of south wing of main building.

Station mark: A blue sandstone post, in center of top of which is a copper station mark.

Distant mark: North of station, 302 feet. A sandstone post, in front of and a little south of main building. Copper station mark in center of top of post.

WEST UNION, DODDRIDGE COUNTY.

Location of station: In public school grounds, 4.7 feet north of fence south of grounds.

Station mark: A sandstone post, 45 by 8 by 8 inches, set 39 inches in the ground, in center of top of which is cemented a bronze tablet. **Reference marks:** Maple tree, 4 inches in diameter, S. 85° W., 5.5 feet distant; southwest corner of school building, N. 5° E., 160 feet distant; southeast corner of school building, N. 29° E., 169 feet distant.

Distant mark: North of station, 303.5 feet. A sandstone post, 35 by 8 by 8 inches, set 35 inches in the ground, in northwest corner of public school grounds, 12 feet south of north fence. Aluminum bolt in center of top of post. **Reference marks:** Northwest corner of school building, S. 22° E., 72 feet distant; locust tree, 8 inches in diameter, N. 40° W., 18.5 feet distant; maple tree, 4 inches in diameter, N. 50° E., 34 feet distant.

Resident referee: County surveyor.

Magnetic declination: $2^{\circ} 20'$ W. July 12, 1898, at 10.30 a. m. Mean annual change, $+03.5'$.

WHEELING, OHIO COUNTY.

[United States Coast and Geodetic Survey meridian marks.]

Location of station: On State fair grounds, inside the race course and near the northwest side of the same.

Station mark: A sandstone post in the center of top of which is a copper bolt.

Distant mark: South of station, between 450 and 500 feet. Inside the race course is a sandstone post similar to the one at station, in the center of top of which is a copper bolt.

Resident referee: Mr. Robert Hazlett, county engineer.

Magnetic declination: $1^{\circ} 01.3'$ W. July 21, 1898. Mean annual change, $+03'$.

WILLIAMSON, MINGO COUNTY.

Location of station: Corner of Second avenue and Third alley.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 38 inches in the ground, in the center of top of which is cemented a bronze tablet. **Reference marks:** South fence of Third alley, 7.3 feet distant; west fence of Second avenue, 4.3 feet distant; southeast corner of house on the northwest corner of street, N. 60° E., 59.4 feet distant.

Distant mark: North of station, 812.2 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on hillside across ravine at the edge of the timber. Aluminum bolt in center of top of post. Reference marks: Oak tree, 36 inches in diameter, N. 5° W., 79.5 feet distant; cherry tree, 14 inches in diameter, N. 84° E., 60 feet distant; oak tree, 5 inches in diameter, N. 88° W., 58 feet distant.

Resident referee: Mr. James A. Chafin, county clerk.

Magnetic declination: $1^{\circ} 42'$ W. November 4, 1898, at 10 a. m.
Mean annual change, $+04'$.

WINFIELD, PUTNAM COUNTY.

Location of station: In the court-house grounds opposite the jail.

Station mark: A sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southwest corner of jail, 80 feet distant; northwest corner of jail, 57.3 feet distant; northwest corner of McLean's office, 21.8 feet distant; southeast corner of jail yard, 15.1 feet distant.

Distant mark: North of station, 308 feet. A sandstone post, 36 by 8 by 8 inches, set 36 inches in the ground, on the north side of Main street, near the back of Hanly & Craighill's store. Aluminum bolt in center of top of post. Reference marks: Southeast corner of Hanly & Craighill's store, 55.6 feet distant; northwest corner of Hanly & Craighill's store, 4.6 feet distant; post is set on the inside of pavement.

Resident referee: Mr. R. A. Salmous, county clerk.

Magnetic declination: $1^{\circ} 30'$ W. November 18, 1898, at 10.40 a. m.
Mean annual change, $+04'$.

OHIO.

Control for the two 15-minute quadrangles within which Columbus is situated was obtained by measuring and expanding a base line south and west of that city. The dome of the State house, located from astronomic observations by the United States and Geodetic Survey in 1871 and 1877, was occupied as a station in the triangulation. The field work was by Mr. S. S. Gannett, in October, 1898. Average closure error of triangles, 2.3 seconds.

COLUMBUS BASE LINE.

Measured along the Baltimore and Ohio Railroad track southwest of Columbus, beginning $4\frac{1}{2}$ miles from the city, in field of H. C. Detwiler, and extending along the railroad tangent 3 miles to a point 900 feet beyond the Urban Crest station.

Length of base when corrected for temperature, slope, and reduced to sea level is 15,759.959 feet.

NORTH BASE, FRANKLIN COUNTY.

Three and one-half miles by wagon road southwest of Columbus post-office, on land owned by H. C. Detwiler, just west of railroad track,

on northern prolongation of tangent and 900 feet north of its extremity. Theodolite elevated 31 feet.

Station mark: Limestone post, 46 by 8 by 8 inches, set 38 inches in the ground, in center of top of which is cemented a bronze tablet. Reference marks: Iron bench-mark post on fence line between the field and railroad right of way, 29.65 feet distant, the azimuth to it being $302^{\circ} 19'$. Iron bench-mark post set in same direction on eastern side of railroad right of way, 90.55 feet distant.

[Latitude, $39^{\circ} 55' 56.68''$. Longitude, $83^{\circ} 03' 07.92''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
South base	33 19 41.30	213 18 30.02	3.6815710
Insane asylum	181 17 57.13	1 17 58.80	3.4544326
Columbus	236 12 51.25	56 15 00.73	3.7603278
Baker	291 30 15.84	111 33 39.03	3.9076388

SOUTH BASE, FRANKLIN COUNTY.

Seven miles by road southwest of Columbus; about 900 feet southwest of Urban Crest station; 280 feet west of Baltimore and Ohio Railroad track; about 200 feet west of Henry Newmeister's house. Instrument elevated 31 feet.

Station mark: Limestone post, 40 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet.

Reference marks: Iron bench-mark post on line between lot and street, 38.70 feet distant; azimuth to it is $96^{\circ} 59'$; iron bench-mark post eastward, 11.20 feet distant; iron bench-mark post southward on line between lot and alley, 30.50 feet distant; azimuth to it $2^{\circ} 16'$.

[Latitude, $39^{\circ} 53' 46.53''$. Longitude, $83^{\circ} 04' 59.02''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Asylum	201 29 28.77	21 30 41.82	3.8676913
North base	213 18 30.02	33 19 41.30	3.6815710
Columbus	225 47 59.84	45 51 20.58	4.0151152
Baker	264 04 45.67	84 09 20.04	4.0092338
Spangler	302 16 28.18	122 19 44.05	3.9339777

BAKER, FRANKLIN COUNTY.

In an orchard owned by Frank S. Miller, on a hill about 50 feet higher than surrounding country, 5 miles southeast of Columbus post-office. The point occupied is 145 feet southwest of the center of a

reservoir, which is on highest part of hill. Theodolite was elevated 25 feet above ground.

Station mark: Iron bench-mark post, set 42 inches in the ground, and marked, "U. \triangle S. G. S."

Reference marks: Iron bench-mark post, southwest 20.6 feet distant, true azimuth, $44^{\circ} 32'$; iron bench-mark post set on bank of reservoir, 132.2 feet distant; true azimuth, $117^{\circ} 11'$.

[Latitude, $39^{\circ} 54' 20.47''$. Longitude, $82^{\circ} 57' 51.27''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Spangler	27 16 07.32	207 14 48.96	3.8021730
South base	84 09 20.04	264 04 45.67	4.0092338
North base	111 33 39.03	291 30 15.84	3.9076388
Asylum	127 58 48.64	307 55 27.15	3.9755769
Columbus	156 08 01.02	336 06 47.21	3.8290019

SPANGLER, FRANKLIN COUNTY.

Seven and one-half miles south of Columbus, on High street extended. A bare hill, about 80 feet higher than surrounding country, commonly known as Spangler Hill from a former owner, but now owned by Mike Duff. Station is on the ridge about 350 feet east of the road, 80 feet south of fence, 100 feet north of and 6 feet lower than highest point of hill.

Station mark: Iron bench-mark post set 3 feet in ground.

Reference mark: Iron bench-mark post set 2 feet south of fence, 78.6 feet distant; true azimuth, $181^{\circ} 32'$.

[Latitude, $39^{\circ} 51' 17.70''$. Longitude, $82^{\circ} 59' 53.50''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
South base	122 19 44.05	302 16 28.18	3.9339777
Asylum	158 19 50.71	338 17 47.73	4.0907165
Columbus	180 49 58.86	0 50 03.50	4.0721158
Baker	207 14 48.96	27 16 07.32	3.8021730

COLUMBUS, FRANKLIN COUNTY.

The roof of State House was occupied and angles reduced to center of flag pole.

Station mark: Center of flag pole.

[Latitude, $39^{\circ} 57' 40.46''$. Longitude, $82^{\circ} 59' 46.26''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Spangler	00 50 03.50	180 49 58.86	4.0721158
South base	45 51 20.58	225 47 59.84	4.0151152
North base	56 15 00.73	236 12 51.25	3.7603278
Asylum	85 43 35.18	265 41 27.41	3.6753250
Baker	336 06 47.21	156 08 01.02	3.8290019

INSANE ASYLUM, FRANKLIN COUNTY.

Three miles west of Columbus. The point occupied is on the southern square tower of the main building. The theodolite was set on iron roof just south of flag pole to which angles are reduced. The main, central tower is 25 or 30 feet higher, but can not be occupied.

Station mark: Center of flag pole.

[Latitude, $39^{\circ} 57' 28.98''$. Longitude, $83^{\circ} 03' 05.20''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
North base	1 17 58.88	181 17 57.13	3.4544326
South base	21 30 41.82	201 29 28.77	3.8676913
Columbus	265 41 27.41	85 43 35.18	3.6753250
Baker	307 55 27.15	127 58 48.64	3.9755769
Spangler	338 17 47.73	158 19 50.71	4.0907165

INSANE ASYLUM, CENTRAL TOWER.

[Latitude, $39^{\circ} 57' 29.47''$. Longitude, $83^{\circ} 03' 05.66''$.]

TENNESSEE.

WAVERLY ASTRONOMIC STATION, HUMPHREYS COUNTY.

In grounds of county court-house, just southeast of the building.

Station mark: Bronze tablet cemented in center of capstone on brick and cement pier, 72 by 18 by 21 inches, set 36 inches in the ground.

Reference marks: Southeast corner of court-house, 21 feet distant, true azimuth of which is $121^{\circ} 55'$; iron fence, 20 feet distant, true azimuth $270^{\circ} 00'$; iron fence, 28.6 feet distant, true azimuth $0^{\circ} 00'$.

Observations for time were made and telegraphic comparison of chronometers were obtained with St. Louis on four nights in May, 1898. Mr. A. Rumel was the observer at the Washington University, St. Louis, and Mr. S. S. Gannett was the observer at Waverly. Observations for personal equation were made at St. Louis immediately after the completion of the field work. The resulting longitude of the pier, west of Greenwich, is $87^{\circ} 47' 36.87''$. Observations for latitude

Talcott method) were made on three nights; 37 results gave $36^{\circ} 04' 59.47'' \pm ".12$ as latitude of same point.

PRIMARY RAILROAD TRAVERSE.

Certain positions in the following lists were published in the Eighteenth Annual Report (Part I, pp. 155-156). They are here republished with corrections and additions. These stations now form a complete circuit and check on the previously published positions.

The following geographic positions were determined by Mr. W. J. Peters in 1896 from primary railroad traverse, starting from Brentwood, on Louisville and Nashville Railroad, across country to Nashville, Chattanooga and St. Louis Railway, thence west on main line to Johnsonville, connecting with the astronomic station at Waverly:

Station.	Latitude.	Longitude.
Brentwood:	° ' "	° ' "
South copper bolt	36 02 01.44	86 47 07.17
North copper bolt	36 02 12.73	86 47 09.47
County crossroads	36 02 13.3	86 49 10.0
Nine-mile stone on Nashville pike	36 02 50.9	86 51 46.6
Bellevue station	36 03 51.4	86 56 20.9
Newsom station	36 04 48.1	86 59 54.0
Road crossing	36 05 46.0	87 02 08.8
Northeast corner Pegram's dwelling	36 05 58.6	87 03 04.7
Kingston Springs station, northeast corner	36 06 07.4	87 06 57.1
Craggie Hope	36 05 42.5	87 09 02.5
Road crossing	36 06 00.9	87 12 02.5
White Bluff station	36 06 17.3	87 13 12.6
Burns station	36 03 18.5	87 18 57.9
Road crossing	36 03 45.8	87 20 27.1
Dickson station	36 04 31.6	87 23 21.8
Road crossing	36 06 00.3	87 27 56.4
Tennessee City station, southwest corner	36 05 33.1	87 30 58.3
Road crossing	36 06 17.7	87 33 55.7
McEwen station	36 06 36.5	87 38 01.3
Briggs station	36 06 25.5	87 41 00.1
Gorman station	36 06 17.3	87 42 30.8
Road crossing	36 05 10.8	87 45 23.6
Waverly station	36 05 14.7	87 47 27.9
Waverly Astron. pier, court-house grounds	36 04 59.47	87 47 36.87
Waverly Presbyterian Church spire	36 05 04.3	87 47 35.1
Frank station	36 04 09.4	87 52 52.5
Box station, northwest corner	36 02 58.6	87 55 19.6
Johnsonville station	36 03 58.4	87 57 46.1
United States Engineer Corps bench mark on railroad bridge over Tennessee River	36 04 07.5	87 57 53.4

The following geographic positions were determined by Mr. W. J. Peters in 1896 from primary railroad traverse, starting from Dickson Junction of the Nashville, Chattanooga and St. Louis Railway, and running south on the Centerville Branch to its terminus:

Station.	Latitude.	Longitude.
	° ' "	° ' "
Tidwell, switch block	36 00 42.5	87 20 06.9
Iron Hill, station and store	35 59 20.4	87 19 27.1
Bon Aqua, station	35 57 11.9	87 19 43.7
Lyles, northwest corner of station	35 55 13.4	87 20 49.0
Graham, northeast corner of station	35 52 29.1	87 27 46.7
Nunelly, northwest corner of station	35 51 34.5	87 28 23.2
Goodrich, northeast corner of station	35 50 37.0	87 28 46.6
Grinders, switch block	35 47 35.1	87 29 06.6
Centerville, station	35 46 41.5	87 28 25.3
Twomey, station	35 45 50.0	87 27 54.4
Swan Junction, switch block	35 41 56.1	87 29 21.3
Ætna, station	35 39 19.9	87 30 15.8
Kimmins, station	35 37 16.8	87 32 16.4
Hohenwald:		
North copper bolt	35 32 53.9	87 33 03.7
South copper bolt	35 32 48.3	87 33 06.4
Northwest corner of station	35 32 51.0	87 33 01.9
Mannie:		
North copper bolt	35 26 17.5	87 36 01.5
South copper bolt	35 26 11.1	87 35 56.4

Positions determined by Mr. Gilbert Thompson in 1896 from primary railroad traverse, starting from Columbia and running northward over the Louisville and Nashville Railroad to Brentwood triangulation station:

Station.	Latitude.	Longitude.
	° ' "	° ' "
Columbia:		
South copper bolt	35 36 40.3	87 03 07.7
North copper bolt	35 36 45.9	87 03 16.1
Godwin station	35 38 58.6	87 02 50.7
Darks Mill station	35 40 48.3	87 00 43.2
Carters Creek station	35 43 02.4	86 59 41.8
Cleburne station	35 44 24.6	86 58 19.5
Ewell station	35 45 38.9	86 56 26.1
Thompson station	35 47 59.9	86 54 29.1
Copper bolt in rock	35 49 08.8	86 53 52.0
Nashville pike crossing	35 52 30.3	86 52 58.0
West Harpeth station	35 50 31.0	86 54 01.7
Franklin station	35 55 20.3	86 51 53.7
Mallory crossroads	35 57 19.3	86 49 55.3
Callender station	35 59 34.2	86 48 08.3
Brentwood triangulation station	36 02 14.7	86 46 49.0

Positions determined from primary traverse by Mr. George T. Hawkins in 1897, from Columbia southward and westward along the Louisville and Nashville Railroad to Napier, thence along wagon roads to Mannie, where connection was made with a station of Mr. Peters's traverse of 1896:

Station.	Latitude.	Longitude.
	° ' "	° ' "
Gore's house, junction of roads 100 yards west of.....	35 26 47.9	87 34 44.8
Forks of road in bottom.....	35 26 46.1	87 32 21.6
Napier, forks of road at mill west of.....	35 26 49.1	87 30 52.8
Old Napier, crossroads at West store	35 26 29.6	87 29 37.7
Napier station.....	35 26 38.7	87 28 33.9
Napier, 3 miles east of, road at sawmill.....	35 26 23.6	87 26 13.4
Barnesville station	35 26 07.6	87 22 48.3
Summertown, road $\frac{1}{4}$ mile north of	35 26 17.0	87 19 03.9
Carpenter, road crossing at	35 27 02.2	87 18 30.5
Rockdale station	35 28 15.4	87 15 35.5
Sandy Hook station	35 29 00.8	87 14 22.2
Mount Pleasant station.....	35 31 57.2	87 12 12.4
Pope, road crossing south of	35 34 42.5	87 08 45.5

Positions determined from primary traverse by Mr. George T. Hawkins in 1897, from Hohenwald across country to Kellys Landing, on Tennessee River:

Station.	Latitude.	Longitude.
	° ' "	° ' "
Linden and Pleasantville roads, forks of	35 33 26.1	87 34 59.5
Hohenwald, 5 miles west of; crossroads on ridge.....	35 33 19.1	87 37 51.2
Hohenwald, 7 miles west of; forks of road	35 33 40.3	87 39 16.0
Little Rock Creek, road crossing at old farm at head of.....	35 31 51.4	87 40 54.7
Farmers Valley, 8 miles east of; milepost	35 30 33.7	87 42 59.6
Farmers Valley, $\frac{1}{4}$ mile south of; northwest corner of church	35 31 08.0	87 49 26.0
Cedar Creek, forks of road on top of ridge at head of.....	35 32 06.4	87 51 01.1
Horner post-office, forks of road at.....	35 31 43.6	87 53 55.9
Kellys Landing, South mark	35 31 50.2	87 58 29.9
North mark	35 31 54.4	87 58 30.1
U. S. B. M	35 31 50.7	87 58 39.0

MINNESOTA MERIDIAN MARKS.

ADA, NOEMAN COUNTY.

Location of station: In court-house square.

Station mark: A limestone post, 42 by 6 by 6 inches, having a bronze tablet cemented in its top, set 38 inches in the ground, on line of trees on south side of square, and 18 feet east of line of trees on west side of square.

Distant mark: North of station, 306 feet. A limestone post, 42 by 6 by 6 inches, set 38 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $11^{\circ} 08'$ E. September 7, 1898.

CROOKSTON, POLK COUNTY.

Location of station: In court-house yard.

Station mark: A limestone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southwest corner court-house, N. 25° E., 139 feet distant; southwest corner jail, S. 54° E., 61 feet distant.

Distant mark: North of station, 280 feet, and 2 feet from northwest corner of court-house square. A limestone post, 42 by 10 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $10^{\circ} 49'$ E. August 20, 1898.

HALLOCK, KITTSON COUNTY.

Location of station: In western part of court-house square.

Station mark: A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground on south fence line, in the center of top of which is cemented a bronze tablet. Reference marks: Southwest corner of court-house, N. 36° E., 150 feet distant; middle of main entrance to court-house, N. 26° E., 180 feet distant.

Distant mark: North of station 300 feet, on north fence line. A limestone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $11^{\circ} 37'$ E. August 26, 1898.

WARREN, MARSHALL COUNTY.

Location of station: In eastern part of schoolhouse square.

Station mark: A limestone post, 48 by 6 by 6 inches, set 44 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southeast corner schoolhouse, N. 55° W., 66 feet distant; southwest corner schoolhouse, N. 82° W., 117 feet distant.

Distant mark: North of station 306 feet, and 2 feet south of north

fence. A limestone post, 48 by 6 by 6 inches, set 44 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $11^{\circ} 26'$ E. September 1, 1898.

NORTH DAKOTA MERIDIAN MARKS.

CARRINGTON, FOSTER COUNTY.

Location of station: In northwestern part of town.

Station mark: A limestone post, 40 by 6 by 10 inches, set 36 inches in the ground on eastern edge of railroad right of way, in the center of top of post is cemented a bronze tablet. Reference marks: Railroad well, S. 20° E., 36 feet distant; southeast corner engine house, N. 55° W., 140 feet distant.

Distant mark: North of station, 500 feet. A limestone post, 36 by 6 by 8 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $13^{\circ} 00'$ E. July 26, 1898.

DEVILS LAKE, RAMSEY COUNTY.

Location of station: In eastern part of schoolhouse yard at the head of Main street.

Station mark: A limestone post, 36 by 6 by 12 inches, set 34 inches in the ground, 74 feet from south fence and 18 feet due east of southeast corner of school building. In the center of top of post is cemented a bronze tablet.

Distant mark: North of station, 300 feet, and is 16 feet south of fence on north side of schoolhouse yard. A limestone post, 33 by 6 by 12 inches, set 32 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $14^{\circ} 06'$ E. August 6, 1898.

FARGO, CASS COUNTY.

Location of station: In court-house grounds.

Station mark: A brownstone post, 36 by 6 by 8 inches, set 34 inches in the ground, 5 feet north of south fence and 16 feet from east fence. In center of top of post is cemented a bronze tablet. Reference marks: Southeast corner court-house, N. 16° W., 106 feet distant.

Distant mark: North of station, 300 feet; 4 feet south of north fence and 42 feet west of east fence. A brownstone post, 24 by 6 by 8 inches, set 24 inches in the ground, in center of top of which is cemented a bronze tablet.

Magnetic declination: $11^{\circ} 03'$ E. September 10, 1898.

GRAND FORKS, GRAND FORKS COUNTY.

Location of station: In grounds of public school.

Station mark: A brownstone post, 40 by 7 by 10 inches, set 40 inches

in the ground, 10 feet from southeast fence. In the center of top of post is cemented a bronze tablet. Reference marks: Northeast corner schoolhouse, N. 6° W., 96 feet distant; southeast corner schoolhouse, N. 34° W., 67 feet distant.

Distant mark: North of station, 272 feet. A brownstone post, 40 by 7 by 10 inches, set 40 inches in the ground, on edge of sidewalk and northwest of entrance to grounds. In the center of top of post is cemented a bronze tablet.

Magnetic declination: $10^{\circ} 45' 30''$ E. August 16, 1898.

LAKOTA, NELSON COUNTY.

Location of station: In western part of court-house square.

Station mark: A granite post, 24 by 10 by 10 inches, set 24 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southwest corner of brick vault, N. 13° E., 147 feet distant; southeast corner court-house, N. 40° E., 146 feet distant; southeast corner court-house square, S. 88° E., 210 feet distant.

Distant mark: North of station, 300 feet. A granite post, 24 by 10 by 10 inches, set 24 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $12^{\circ} 38' 30''$ E. August 9, 1898.

MINNEWAUKAN, BENSON COUNTY.

Location of station: In northwestern part of town, on west side of railroad.

Station mark: A granite post, 36 by 8 by 8 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northwest corner of elevator, S. 38° E., 276 feet distant; north switch block, N. 68° W., 159 feet distant.

Distant mark: North of station, 500 feet. A granite post, 36 by 8 by 8 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $14^{\circ} 31'$ E. July 30, 1898.

NEW ROCKFORD, EDDY COUNTY.

Location of station: In northern part of town, on line with sidewalk of Main street.

Station mark: A granite post, 36 by 8 by 8 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Northeast corner of yard fence, S. 5° W., 100 feet distant; northwest corner of elevator, S. 30° E., 280 feet distant.

Distant mark: North of station, 600 feet. A granite post, 36 by 8 by 8 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $13^{\circ} 22'$ E. July 27, 1898.

ARKANSAS MERIDIAN MARKS.

ARCADELPHIA, CLARK COUNTY.

Location of station: Near court-house.

Station mark: A granite post, 32 by 8 by 12 inches, set 30 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Southeast corner court-house, N. 25° W., 86 feet distant; southeast corner court-house square, S. 80° E., 54 feet distant.

Distant mark: North of station, 300 feet. A granite post, 20 by 8 by 8 inches, set 20 inches in the ground, on vacant lot on north side of street. In center of top of post is cemented a bronze tablet.

Magnetic declination, $6^{\circ} 55'$ E. October 14, 1898.

BENTON, SALINE COUNTY.

Location of station: On a section line, about 600 feet northwest of railroad station.

Station mark: A granite post, 36 by 8 by 10 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Walnut tree 18 inches in diameter, N. 40° W., 43 feet distant; railroad water tank, S. 80° E., 160 feet distant.

Distant mark: North of station, 360 feet. A granite post, 30 by 8 by 12 inches, set 30 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $7^{\circ} 01'$ E. October 8, 1898.

MALVERN, HOT SPRINGS COUNTY.

Location of station: In court-house square, on west side of court-house.

Station mark: A limestone post, 48 by 8 by 8 inches, set 40 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: South corner of court-house, N. 20° E., 135 feet distant; gate on southwest side of square, N. 63° W., 105 feet distant.

Distant mark: North of station, 300 feet. A limestone post, 40 by 8 by 8 inches, set 40 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $5^{\circ} 23'$ E. October 11, 1898.

MENA, POLK COUNTY.

Location of station: In eastern part of court-house square.

Station mark: A limestone post, 36 by 6 by 8 inches, set 34 inches in the ground on line of sidewalk, in the center of top of which is cemented a bronze tablet.

Distant mark: North of station, 320 feet on line of sidewalk. A limestone post, 24 by 6 by 8 inches, set 24 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination, $7^{\circ} 39'$ E. November 15, 1898.

PRESCOTT, NEVADA COUNTY.

Location of station: In court-house square.

Station mark: A limestone post, 40 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: West corner of jail, N. 54° E., 57 feet distant; well, N. 18° W., 153 feet distant.

Distant mark: North of station, 285 feet. A limestone post, 40 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $6^{\circ} 11'$ E. October 20, 1898.

TEXARKANA, MILLER COUNTY.

Location of station: In the eastern part of court-house square.

Station mark: A limestone post, 38 by 8 by 12 inches, set 38 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Center of south door in court-house, N. 35° W., 58 feet distant; southwest corner court-house, N. 53° W., 64 feet distant.

Distant mark: North of station, 316 feet. A limestone post, 38 by 8 by 12 inches, set 38 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $6^{\circ} 54'$ E. October 27, 1898.

SOUTH DAKOTA AND WYOMING.

Owing to a clerical error the positions of Redbird, Newcastle, and Alkali Butte stations and the azimuths between them, and to Elk and Sullivan stations, as given in the Nineteenth Annual Report (Appendix to Nineteenth Annual Report of the United States Geological Survey, pp. 162, 163, 164) were copied from preliminary unadjusted work from incomplete field observations. Mr. R. H. Chapman, in May and June, 1898, completed the field observations and established azimuth stations at Newcastle, Wyoming, and Custer, South Dakota.

The following results are from the adjusted work:

SULLIVAN, CUSTER COUNTY, SOUTH DAKOTA.

[Latitude, $43^{\circ} 35' 35.28''$. Longitude, $103^{\circ} 59' 44.43''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Alkali.....	97 17 56.99	276 57 53.60	4.5957584
Newcastle.....	147 43 13.94	327 32 32.74	4.5884189
Elk.....	165 48 41.64	345 46 44.12	4.1916527
Redbird.....	170 42 11.55	350 39 58.87	4.4241460

APPENDIX TO DIRECTOR'S REPORT.

ELK, CUSTER COUNTY, SOUTH DAKOTA.

[Latitude, 43° 43' 43.63". Longitude, 104° 02' 34.69".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Alkali.....	74 03 06.51	253 44 59.22	4.5646704
Newcastle.....	136 18 25.27	316 09 41.15	4.3885554
Bear Spring.....	237 18 24.37	57 31 06.81	4.4657772
Sullivan.....	345 46 44.12	165 48 41.64	4.1916527
Redbird.....	177 30 11.30	357 29 56.26	4.0470226

BEAR SPRING, CUSTER COUNTY, SOUTH DAKOTA.

[Latitude, 43° 52' 13.56". Longitude, 103° 44' 13.13".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Elk.....	57 31 06.81	237 18 24.37	4.4657772
Redbird.....	79 42 04.00	259 29 05.82	4.4067069

NEWCASTLE, WESTON COUNTY, WYOMING.

[Latitude, 43° 53' 16.11". Longitude, 104° 15' 11.82".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Alkali.....	33 21 37.44	213 12 12.25	4.5225587
Elk.....	316 09 41.14	136 18 25.26	4.3885554
Sullivan.....	327 32 32.74	147 43 13.94	4.5884189
Redbird.....	291 37 41.69	111 46 11.23	4.2473917

ALKALI (ALKALI BUTTE), WESTON COUNTY, WYOMING.

[Latitude, 43° 38' 39.88". Longitude, 104° 28' 48.96".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Newcastle.....	213 12 12.25	33 21 37.44	4.5225587
Elk.....	253 44 59.22	74 03 06.51	4.5646704
Sullivan.....	276 57 53.60	97 17 56.99	4.5957584
Redbird.....	238 19 46.33	58 37 39.60	4.6102324

REDBIRD, WESTON COUNTY, WYOMING.

[Latitude, 43° 49' 44.36". Longitude, 104° 02' 56.42".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Bear Spring	259 29 05.82	79 42 04.00	4.4067069
Sullivan	350 39 58.87	170 42 11.55	4.4241460
Alkali.....	58 37 39.60	238 19 46.33	4.6102324
Newcastle.....	111 46 11.23	291 37 41.69	4.2473917
Elk	357 29 56.26	177 30 11.30	4.0470226

HIGH SCHOOL (NEWCASTLE), WESTON COUNTY, WYOMING.

Spire of tower on high-school building, on hill, eastern side of town. Instrument was set up several feet south of tower in playground and reduction to center made.

Station mark: Spire of tower.

[Latitude, 43° 51' 08.80". Longitude, 104° 11' 39.29".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Redbird	282 31 41.30	102 37 43.47	4.0780296
Elk	318 23 54.86	138 30 11.73	4.2638383

CUSTER, PENNINGTON COUNTY, SOUTH DAKOTA. MERIDIAN MARK.

Location of station: In front of entrance to court-house, on north line of Custer avenue (Main street).

Station mark: Granite post, 36 by 8 by 8 inches, set 30 inches in the ground, with bronze tablet cemented in center of top.

Distant mark: South of station, 1,510 feet. A bronze tablet set in rock in place, on top of rock pinnacle.

Resident referee: A. H. Smith, county surveyor.

MISSOULA, MISSOULA COUNTY, MONTANA. MERIDIAN MARK.

Location of station: In grounds of Montana University, about 20 feet east of fence on western boundary.

Station mark: Granite post, 48 by 6 by 6 inches, set 44 inches in the ground, in the center of top of which is cemented a bronze tablet.

Reference marks:

	True azim.
Montana University, Science Hall, west corner, distance 464.1 feet.....	270° 38'
St. Marys Peak	27° 07'
Fort Missoula, flagstaff (distance 5 miles, approximate)	70° 24'
Public school, flagstaff on tower	104° 48'

Distant mark: North of station, 695.75 feet. Granite post, 48 by 6 by 6 inches, set 44 inches in the ground, in the center of top of which is cemented a bronze tablet.

Magnetic declination: $21^{\circ} 33'$ east. November 16, 1898.

Resident referees: President, professors, and students of Montana University.

NEWCASTLE, WESTON COUNTY, WYOMING. MERIDIAN MARK.

Location of station: In public park in northwestern part of town, just inside of fence line. Is 13.3 feet north from fence post at southern corner of park.

Station mark: Sandstone post, 36 by 8 by 8 inches, set about 34 inches in the ground, in the center of top of which is cemented a bronze tablet.

Distant mark: North of station, about 520 feet. Just inside of fence line bounding public park on northwest side. Limestone post, 24 by 10 by 10 inches, set 20 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference mark: Post at angle in fence, about 100 feet distant to northeast.

VERNAL, UINTA COUNTY, UTAH. MERIDIAN MARK.

Location of station: In the court-house grounds, nearly on the east and west building line and about 10 feet west of the north and south building line.

Station mark: Sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.

Distant mark: North of station, 419 feet. Sandstone post, 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet.

Resident referee: The county surveyor.

UTAH-WYOMING.

Uinta Forest Reserve.

The following stations in the triangulation of the Uinta Forest Reserve form a belt of quadrilaterals along the forty-first parallel of latitude between the meridians of $109^{\circ} 15'$ and $111^{\circ} 15'$. The field work was done by H. L. Baldwin, jr., in 1898, and is a continuation of work commenced by him in 1897, being based on United States Coast and Geodetic Survey stations of the transcontinental belt of triangulation.

RICHARDS BUTTE, SWEETWATER COUNTY, WYOMING.

This is said to be the local name of a large prominent mountain upon which this station is situated. It is less than a mile north of the Utah line.

Station mark: Bronze tablet cemented in a large sandstone rock.

Reference mark: A rock monument, $4\frac{1}{2}$ feet in diameter and 6 feet high, stands north, 6.25 feet distant, true azimuth of which is $194^{\circ} 59'$.

[Latitude, $41^{\circ} 00' 48.10''$. Longitude, $109^{\circ} 18' 21.15''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Lena.....	20 10 06.03	200 05 46.41	4.4308321
Marsh.....	52 47 16.79	232 26 43.26	4.7448668
Phil Pico.....	84 57 55.01	264 33 39.66	4.7166464
Twin Buttes.....	118 36 40.77	298 20 53.82	4.5826286

MOUNT LENA, UINTA COUNTY, UTAH.

Station is on the summit of the mountain, so called on Hayden's map, and is nearly bare on top.

Station mark: Copper bolt cemented in sandstone rock.

Reference point: Center of a large dead (double) tree, used as a signal, 23.1 feet distant, true azimuth of which is $31^{\circ} 13'$.

[Latitude, $40^{\circ} 47' 07.30''$. Longitude, $109^{\circ} 24' 57.68''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Little.....	41 08 53.64	220 57 46.65	4.5636206
Marsh.....	76 34 45.79	256 18 33.93	4.5554785
Leidy.....	86 48 38.91	266 32 13.45	4.5495348
Twin Buttes.....	150 49 48.98	330 38 24.24	4.6983739
Richards Butte.....	200 05 46.41	20 10 06.03	4.4308321

LITTLE MOUNTAIN, UINTA COUNTY, UTAH.

Station is on mountain known on Hayden map as Obelisk Plateau, locally known as Little Mountain, and near highest point.

Station mark: Copper bolt cemented in sandstone rock and marked S. G.

"U. Δ S."

Reference point: A post on highest point of mountain, marking the corner of U. S. M. R. ("O. M. R."), and supported by a pile of rocks, 9.55 feet distant, true azimuth of which is $30^{\circ} 26'$.

[Latitude, $40^{\circ} 32' 12.27''$. Longitude, $109^{\circ} 42' 01.33''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Marsh.....	150 21 32.60	330 16 29.67	4.3440739
Trout.....	178 22 00.28	358 21 38.42	4.4410093
Lena.....	220 57 46.65	41 08 53.64	4.5636206

TWIN BUTTES, SWEETWATER COUNTY, WYOMING.

This station is on the most northern of three mounds, so called, and near the northwestern end of the nearly flat top.

Station mark: Aluminum bolt cemented in large sandstone rock.

Reference point: Rock monument, 5 feet base and 5 feet high, 6.07 feet distant, true azimuth of which is $118^{\circ} 21'$.

[Latitude, $41^{\circ} 10' 39.36''$ Longitude, $109^{\circ} 42' 21.77''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Marsh.....	11 21 36.28	191 16 44.77	4.7243742
Phil Pico	38 22 43.11	218 14 11.90	4.4668899
Richards	298 20 53.82	118 36 40.77	4.5826286
Lena.....	330 38 24.24	150 49 48.98	4.6983739

TROUT CREEK PEAK, UINTA COUNTY, UTAH.

Station is on the sharp pointed peak (bare on top) at the head of Trout Creek, from which the station is named.

Station mark: Aluminum bolt cemented in sandstone rock on highest point of hill.

Reference point: Small rock monument, 7.1 feet distant, true azimuth of which is $16^{\circ} 17'$.

[Latitude, $40^{\circ} 47' 06.88''$ Longitude, $109^{\circ} 42' 34.89''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Marsh.....	50 20 15.57	230 15 33.77	4.1193965
Leidy	79 07 15.67	259 02 20.69	4.0329077
Phil Pico.....	139 02 07.93	318 53 47.32	4.4358661
Little	358 21 38.42	178 22 00.28	4.4410093

MARSH PEAK, UINTA COUNTY, UTAH.

On peak of same name at eastern end of that portion of the Uinta Range which rises above timber line.

Station mark: Aluminum tablet cemented in large flat rock with rocks piled around and over it.

Reference point: Large rock monument, 15.75 feet distant, true azimuth of which is $276^{\circ} 53'$.

[Latitude, $40^{\circ} 42' 34.27''$. Longitude, $109^{\circ} 49' 46.61''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Gilbert.....	106 17 56.84	285 57 54.37	4.6528443
Phil Pico.....	164 57 30.26	344 53 52.36	4.4774219
Twin.....	191 16 44.77	11 21 36.28	4.7243742
Richard.....	232 26 43.26	52 47 16.79	4.7448668
Trout.....	230 15 33.77	50 20 15.57	4.1193965
Lena.....	256 18 33.93	76 34 45.79	4.5554785
Little.....	330 16 29.67	150 21 32.60	4.3440739
Leidy.....	175 47 45.98	355 47 32.96	3.8050158

LEIDY PEAK, UINTA COUNTY, UTAH.

Station is on top of the peak of this name.

Station mark: Aluminum tablet cemented in large flat rock with rocks piled around and over it. A rock monument a little below the summit of hill, 228.4 feet distant, true azimuth of which is $225^{\circ} 09'$, has been intersected by the United States Coast and Geodetic Survey.

Reference points: Small rock monument, 178.1 feet distant, true azimuth of which is $149^{\circ} 02'$; large rock monument, 56.77 feet distant, true azimuth of which is $28^{\circ} 16'$.

[Latitude, $40^{\circ} 46' 00.64''$. Longitude, $109^{\circ} 50' 06.56''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Trout.....	259 02 20.69	79 07 15.67	4.0329077
Lena.....	266 32 13.45	86 48 38.91	4.5495348
Marsh.....	355 47 32.96	175 47 45.98	3.8050158
Gilbert.....	98 19 48.53	277 59 58.40	4.6349051
North Burro.....	106 21 46.41	286 08 25.71	4.4759138
Widdop.....	137 21 19.44	317 12 05.04	4.4661529
Phil Pico.....	162 03 43.79	342 00 18.81	4.3762495

PHIL PICO, UINTA COUNTY, UTAH.

This station is on the summit of a mountain known locally by this name, called Mount Carson on some published maps. Summit of mountain is nearly bare of timber.

Station mark: Bronze tablet cemented in sandstone rock, a little west of top of mountain.

APPENDIX TO DIRECTOR'S REPORT.

[Latitude, 40° 58' 14.01". Longitude, 109° 55' 19.81".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
North Burro.....	56 21 24.17	236 11 26.95	4.4093441
Gilbert.....	65 05 44.53	244 49 17.03	4.5907340
Widdop.....	84 52 07.73	264 46 17.54	4.0983391
Milepost 315.....	104 32 36.50	284 27 31.69	4.0500875
Milepost 314.....	106 58 02.38	286 53 42.99	3.9851831
Turtle Bluff.....	136 11 24.45	316 05 47.53	4.2382264
Sage Creek.....	138 51 52.33	318 43 43.73	4.4210704
Twin Buttes.....	218 14 11.90	38 22 43.11	4.4668899
Richards Butte.....	264 33 39.66	84 57 55.01	4.7186466
Trout Creek.....	318 53 47.32	139 02 07.93	4.4358661
Leidy Peak.....	342 00 18.81	162 03 43.79	4.3762495
Marsh Peak.....	344 53 52.36	164 57 30.26	4.4774219

MILEPOST 314, SWEETWATER COUNTY, WYOMING.

This point was occupied as an aid to the marking of a point on the thirty-third degree west from Washington, it being the three hundred and fourteenth milepost on the Utah-Wyoming line. It lies on high rolling ground about three-eighths of a mile west of Burnt Fork Creek.

Station mark: Aluminum tablet cemented in 500-pound waterworn granite boulder.

[Latitude, 40° 59' 45.25". Longitude, 110° 01' 55.31".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Widdop.....	39 24 22.24	219 22 51.33	3.7081764
Milepost 315.....	89 50 52.50	269 50 07.06	3.2092339
Turtle.....	164 07 16.79	344 05 59.45	4.0021307
Phil Pico.....	286 53 42.99	106 58 02.38	3.9851832

UINTA-SWEETWATER COUNTY LINE.

On the State line between Wyoming and Utah, about 33° west from the meridian of Washington (the old Naval Observatory), which, according to statute, is the line dividing Uinta County, Wyoming, on the west, from Sweetwater County, Wyoming, on the east. It falls on ground gently sloping to the north, and was established by measuring 312.14 feet easterly from milepost 315 on the line to milepost 314, and the point marked by a bronze tablet cemented in a waterworn granite boulder. The boulder weighs about 1,200 pounds, and shows above ground 6 inches, with a light red surface of 1½ by 2 feet. It was established in the field from preliminary computations, and is 7.63 feet too far east. Elevation, about 8,000 feet above sea.

[Latitude, 40° 59' 45.11". Longitude, 110° 03' 00.50'']

This position is as near to the thirty-third meridian west of Washington as could be determined from the incomplete data at hand. It is based on positions of certain stations near Salt Lake, in the transcontinental belt of triangulation, by the United States Coast and Geodetic Survey, and furnished in 1896 for use of the Geological Survey before the final adjustment of the whole belt was complete. The longitudes given were west of Greenwich, and in changing them to Washington longitudes the difference between Washington and Greenwich was taken as 77° 03' 0.60" west, being the value given in all editions of the American Ephemeris prior to 1896.

MILEPOST 315.

On the Utah-Wyoming State line, and supposed to be 1 mile west of milepost 314, but in reality 32 feet greater. It stands on the side of a hill facing north and about 312 feet west of the county line between Uinta and Sweetwater counties, which line was established by measurements from this milepost and also from milepost 314.

Station mark: Aluminum bolt cemented in top of 500-pound water-worn granite boulder, marked "U. S. G. S."

[Latitude, 40° 59' 45.11". Longitude, 110° 03' 04.57'']

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Turtle	173 19 09.14	353 18 37.28	3.9883758
Milepost 314.....	269 50 07.06	89 50 52.50	3.2092339
Phil Pico	284 27 31.69	104 32 36.50	4.0500875

TURTLE BLUFFS, UINTA COUNTY, WYOMING.

This station is on the south edge of a plateau, the local name of which is Dry Creek Mountain; about one-half mile east of the west end of the bluff, and just north of the chimney rocks.

Station mark: Aluminum tablet cemented in large sandstone rock set in the soft earth and projecting about 3 inches above the surface.

[Latitude, 41° 04' 58.56". Longitude, 110° 03' 53.10'']

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Widdop	2 03 04.07	182 02 50.39	4.1342008
Gilbert.....	38 51 42.30	218 40 50.12	4.5701206
Sage	143 51 13.52	323 48 41.90	3.9597607
Phil Pico	316 05 47.53	136 11 24.45	4.2382265
Milepost 314.....	344 05 59.45	164 07 16.79	4.0021307
Milepost 315.....	353 18 37.28	173 19 09.14	3.9883758

WIDDOP, SUMMIT COUNTY, UTAH.

This station is at the summit of a prominent, sharp-pointed mountain, timbered on the north side, bare on the south side, about 6 miles southwest of Burnt Fork post-office, Wyoming, about 2½ miles south of the Wyoming line.

Station mark: Copper bolt cemented into a large rock on the northeast end of highest part of hill.

[Latitude, 40° 57' 37.30". Longitude, 110° 04' 13.94".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
North Burro.....	34 01 34.22	213 57 26.78	4.1992424
Gilbert.....	56 07 22.44	235 56 44.70	4.4392978
Sage Creek.....	166 52 26.54	346 50 08.80	4.3331427
Turtle Bluff.....	182 02 50.39	2 03 04.07	4.1342008
Milepost 314.....	219 22 51.33	39 24 22.24	3.7081763
Phil Pico.....	264 46 17.54	84 52 07.73	4.0983391
Leidy.....	317 12 05.04	137 21 19.44	4.4661529

SAGE CREEK MOUNTAIN, UINTA COUNTY, WYOMING.

This station is near the north end of the large, prominent plateau of this name, and about 120 yards southwest of the clump of large pines which grow over the north slope.

Station mark: Copper bolt cemented in large limestone rock, 200 pounds in weight, which is buried flush with surface of ground.

[Latitude, 41° 08' 57.10". Longitude, 110° 07' 43.66".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
North Burro.....	6 35 36.05	186 33 45.72	4.5354744
Gilbert.....	26 15 37.06	206 07 15.66	4.6073550
Elizabeth.....	69 21 33.00	248 57 47.53	4.7341271
Bridger.....	120 04 14.77	299 50 56.74	4.5126614
Phil Pico.....	318 43 43.73	138 51 52.33	4.4210704
Turtle.....	323 48 41.90	143 51 13.52	3.9597607
Widdop.....	346 50 08.80	166 52 26.54	4.3331427

NORTH BURRO PEAK, SUMMIT COUNTY, UTAH.

This station is on the northern portion of Burro Peak, which has several summits, this not being the highest one. Elevation about 13,000 feet above sea.

Station mark: Aluminum bolt cemented into the rock and roughly
S. G.
marked "U. \triangle S."

Reference point: A rock signal 3 feet high, 6.23 feet distant, the true
azimuth of which is $215^{\circ} 30'$.

[Latitude, $40^{\circ} 50' 32.05''$. Longitude, $110^{\circ} 10' 31.85''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Gilbert	80 55 29.67	260 48 59.78	4.1507851
Sage	186 33 45.72	6 35 36.05	4.5354744
Widdop	213 57 26.79	34 01 34.22	4.1992422
Phil Pico.....	236 11 26.95	56 21 24.17	4.4093437
Leidy	286 08 25.71	106 21 46.41	4.4759138

GILBERT PEAK, UTAH.

On line between Wasatch and Summit counties.

On highest peak in the Uinta Mountains. Elevation about 13,600
feet.

Station mark: Aluminum tablet cemented near the center of a large
flat rock, 3 by 5 feet, which is nearly north of the monument.

Reference point: A rock monument, 4 feet in diameter and 8 feet
high, 14.7 feet distant, the true azimuth of which is $9^{\circ} 55'$.

[Latitude, $40^{\circ} 49' 19.27''$. Longitude, $110^{\circ} 20' 28.14''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
La Motte.....	81 06 59.99	260 50 51.41	4.5463817
Elizabeth	117 31 02.97	297 15 42.71	4.5688389
Medicine Butte.....	141 06 32.62	320 44 09.44	4.8789554
Bridger	168 49 37.41	348 44 44.12	4.7292994
Sage Creek	206 07 15.66	26 15 37.06	4.6073550
Turtle	218 40 50.12	38 51 42.30	4.5701206
Widdop	235 56 44.70	56 07 22.44	4.4392978
Phil Pico.....	244 49 17.03	65 05 44.53	4.5907340
North Burro.....	260 48 59.78	80 55 29.67	4.1507851
Leidy	277 59 58.40	98 19 48.53	4.6349061
Marsh.....	285 57 54.37	106 17 56.84	4.6528443

BRIDGER BUTTE, UINTA COUNTY, WYOMING.

This station is at the northeast corner of the butte locally known as
Bridger Butte, about 4 miles westerly from the site of the abandoned
Fort Bridger.

Station mark: Copper bolt cemented in rock set in the ground.

[Latitude, $41^{\circ} 17' 44.17''$. Longitude, $110^{\circ} 27' 54.67''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
La Motte.....	22 42 09.08	202 30 49.01	4.7989623
Elizabeth	32 16 07.14	212 05 36.24	4.6232355
Medicine Butte.....	99 33 10.80	279 15 36.14	4.5758036
Sage Creek.....	299 50 56.74	120 04 14.77	4.5126614
Gilbert.....	348 44 44.12	168 49 37.41	4.7292993

ELIZABETH MOUNTAIN, SUMMIT COUNTY, UTAH.

Is a high spur or offshoot from the plateau about $1\frac{1}{2}$ miles south of the Utah-Wyoming State line.

Station mark: Iron bench-mark post, set 3 feet in the ground and a few feet northwest along ridge from the highest point.

Reference points: Two spruce trees, one 16.2 feet distant, true azimuth of which is $359^{\circ} 04'$, and the other 11 feet distant, true azimuth of which is $43^{\circ} 24'$.

[Latitude, $40^{\circ} 58' 31.88''$. Longitude, $110^{\circ} 43' 53.71''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
La Motte.....	4 33 59.03	184 33 06.75	4.3547517
Wanship	78 10 23.20	257 40 55.75	4.8101047
Porcupine.....	98 16 15.95	278 01 19.09	4.5089290
Medicine Butte.....	160 25 18.00	340 18 17.93	4.6461626
Bridger Butte	212 05 36.24	32 16 07.14	4.6232355
Sage Creek.....	248 57 47.53	69 21 33.00	4.7341271
Gilbert	297 15 42.71	117 31 02.97	4.5688389

LA MOTTE, SUMMIT COUNTY, UTAH.

Station is on high peak of same name, between the east and middle forks of Bear River.

Station mark: Bronze tablet cemented in large rock near the center of the flat rocky top of mountain.

Reference point: A rock monument, 26.6 feet distance, the true azimuth of which is $359^{\circ} 23'$.

[Latitude, 40° 46' 20.47". Longitude, 110° 45' 10.55'']

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Kamas	76 37 12.63	256 19 45.47	4.5880746
Wanship	98 37 13.25	278 08 39.63	4.7931735
Porcupine	132 03 15.48	311 49 10.76	4.6085658
Medicine	168 31 21.11	348 25 12.35	4.8168080
Elizabeth	184 33 08.75	4 33 59.03	4.9547517
Bridger	202 30 49.01	22 42 09.08	4.7989623
Gilbert	260 50 51.41	81 06 59.99	4.5463816

MEDICINE BUTTE, UINTA COUNTY, WYOMING.

Station is situated on butte of same name (also called "Alma Mountain"), a few miles east of Alma, and about 6 miles north of Evanston, Wyoming.

Station mark: Copper bolt cemented in limestone rock on the summit.

Reference point: A rock monument, 3.8 feet distance, the true azimuth of which is 173°.

[Latitude, 41° 21' 03.65". Longitude, 110° 54' 31.92'']

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Porcupine	24 39 19.35	204 31 19.36	4.6109651
Bridger Butte	279 13 36.14	99 33 10.80	4.5758036
Gilbert	320 44 09.44	141 06 32.63	4.8789551
Elizabeth	340 18 17.93	160 25 18.00	4.6461626
La Motte	348 25 12.35	168 31 21.11	4.8168080
Kamas	18 29 12.96	198 17 48.11	4.8879969

PORCUPINE, SUMMIT COUNTY, UTAH.

This station is on the large mountain 3 miles west of the southwest corner of Wyoming.

Station mark: Copper bolt marked "U. S. G. S. Δ "

Reference point: A rock monument, 14.95 feet distant, the true azimuth to which is 78°.

[Latitude, 41° 01' 0.16". Longitude, 111° .06' 40.85'']

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Kamas	11 31 57.03	191 28 31.31	4.5674578
Wanship	59 59 15.94	239 44 43.53	4.5565128
Medicine Butte	204 31 19.36	24 39 19.35	4.6109651
Elizabeth	278 01 19.09	98 16 15.95	4.5089290
La Motte	311 49 10.76	132 03 15.48	4.6085658

IDAHO-MONTANA.

Mr. E. T. Perkins extended his triangulation of 1897, dependent upon the Spokane base, northward to the international boundary line, reoccupying Blacktail, Roundtop, and Scotchman, and occupying nine new stations.

Five secondary stations near the Idaho-Montana boundary line were also located.

NEWTON, FLATHEAD COUNTY, MONTANA, NEAR IDAHO BOUNDARY LINE.

Station on second summit to southeast of Newton Pass on trail from Newton's ranch to Sylvanite.

Station mark: Iron bolt in solid rock, above which is a rock cairn 5 feet in height.

[Latitude, $48^{\circ} 41' 54.51''$. Longitude, $115^{\circ} 58' 35.26''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Scotchman	7 56 25.44	187 51 39.02	4.7576096
Blue	56 31 23.44	236 01 09.17	4.7758946
Doust	62 36 15.35	242 25 12.51	4.3089562
Cross	140 57 32.97	320 56 10.32	3.5525754
Ewing	178 55 40.21	358 55 22.48	4.4087123

EWING, FLATHEAD COUNTY, MONTANA.

In extreme northwest corner of State, about 35 miles northeast of Bonners Ferry, Idaho. It can be reached by trail to Buckhorn mines, then along divide 4 miles to break-off, then northeast down into basin or meadows, again ascending ridge in northwest direction, thence along ridge to summit.

Station mark: Copper bolt in loose rock, above which is cairn of rocks $4\frac{1}{2}$ feet high.

[Latitude, $48^{\circ} 55' 43.99''$. Longitude, $115^{\circ} 58' 58.82''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Cross	4 25 15.00	184 24 09.92	4.3602056
Buckhorn	16 51 04.97	196 47 42.90	4.2581050
Doust	26 41 59.63	206 31 13.33	4.5929986
Transit station 949	65 56 28.90	245 53 26.30	3.7325500
Hell Roaring	82 39 27.78	262 28 39.26	4.2471106
Border	115 18 08.80	295 07 37.22	4.2747300
Newton	358 55 22.48	178 55 40.21	4.4087124

CROSS, FLATHEAD COUNTY, MONTANA.

Station on first summit to northwest of Newton Pass, on trail between Sylvanite and Newton's ranch.

Station mark: Copper bolt in loose rocks, above which is cairn of rocks 4½ feet high.

[Latitude, 48° 43' 24.24". Longitude, 116° 00' 25.26".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Doust	52 29 34.08	232 19 53.73	4.3000841
Hell Roaring	142 34 02.70	322 24 20.27	4.4137728
Buckhorn	147 40 20.26	327 38 03.50	3.8142800
Ewing	184 24 09.92	4 25 15.00	4.3602056
Newton	320 56 10.32	140 57 32.97	3.5525754

STADIA STATION 154, NEAR IDAHO-MONTANA BOUNDARY LINE.

A secondary station.

Ascended by trail from Clark Fork, Idaho, via Homestake Cabin, to Blue Creek; two hours' trip to cabin, one and one-half hours from there to camp on Blue Creek. Climb ridge from Blue Creek to station in one and one-half hours; ascending on south side of ridge.

Station mark: Copper bolt in rock, over which is a rock cairn 3 feet in height.

[Latitude, 48° 08' 50.14". Longitude, 116° 02' 59.84".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Blacktail	84 58 53	264 37 52	4.54599
Scotchman	152 05 45	332 04 17	3.71732
Scotchman (2)	177 34 42	357 34 30	3.87099
Divide	354 53 39	174 54 44	4.30621

TRANSIT STATION 949, NEAR IDAHO-MONTANA BOUNDARY LINE.

A secondary station on a large hill, 6½ miles, air line, south of international boundary.

Station mark: None.

Reference mark: Signal tree, distant 138 feet, azimuth to which is 308° 55'.

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[Latitude, 48° 54' 32.59". Longitude, 116° 03' 01.05".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Buckhorn	1 09 25.9	181 09 14.6	4. 18013
Doust	21 04 23.9	200 56 39.8	4. 54598
Ewing	245 53 26.3	65 56 28.9	3. 73255

SCOTCHMAN (2), KOOTENAI COUNTY, IDAHO, NEAR MONTANA BOUNDARY LINE.

A secondary station, occupied with transit.

[Latitude, 48° 12' 50.40". Longitude, 116° 03' 14.98".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Scotchman	37 07 25	217 06 08	3. 54730
Divide	355 37 01	175 38 16	4. 44183
Transit station 154	357 34 30	177 34 42	3. 87099

BUCKHORN, KOOTENAI COUNTY, IDAHO.

A secondary station.

[Latitude, 48° 46' 22.57". Longitude, 116° 03' 16.03".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Doust	34 55 05.20	214 47 32.90	4. 33338
Transit station 949	181 09 14.60	1 09 25.90	4. 18013
Newton	325 15 17.30	145 18 48.30	4. 00320
Ewing	196 47 42.90	16 51 04.97	4. 25810
Cross	327 38 03.50	147 40 20.26	3. 81428

BLACKTOP, KOOTENAI COUNTY, IDAHO, NEAR MONTANA BOUNDARY LINE.

A secondary station. Reached from Clark Fork, Idaho, by trail to Homestake Cabin, thence to divide between Blue and Mosquito creeks, then by four hours' foot travel to station, following along slope of mountain.

Station mark: Cross cut on solid rock, under a rock monument, 3 feet in height.

[Latitude, $48^{\circ} 11' 50.72''$. Longitude, $116^{\circ} 03' 49.28''$.]

To station—	Asimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Scotchman	55 42 20	235 41 29	3.23516
Transit station 154	349 37 02	169 37 39	3.75359

BORDER, IN BRITISH COLUMBIA.

Just north of Kootenai County, Idaho. Reached from the Mooyie trail by a trail to Grierson's ranch, thence by Indian trail to small lake lying east, around lake to ridge, up ridge to station.

Station mark: Copper bolt in solid rock, above which is a rock cairn $4\frac{1}{2}$ feet high.

[Latitude, $49^{\circ} 00' 03.60''$. Longitude, $116^{\circ} 12' 56.12''$.]

To station—	Asimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Hell Roaring	2 36 33.65	182 36 16.26	4.01348
Mooyie	87 49 12.16	267 48 09.25	3.22930
Ewing	295 07 37.22	115 18 08.80	4.27473

DOUST, KOOTENAI COUNTY, IDAHO.

About 7 miles southeast from Bonners Ferry. Best ascended from Wright's ranch in Paradise Valley. Follow trail leading to mineral claims of Doust & Wright to summit of Wright Mountain, then along ridge over fallen timber to station; three hours' travel.

Station mark: Copper bolt in solid rock, above which is a rock cairn 5 feet in height.

[Latitude, $48^{\circ} 36' 50.16''$. Longitude, $116^{\circ} 13' 18.15''$.]

To station—	Asimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Blacktail	21 59 49.24	201 46 25.83	4.7734417
Blue	53 12 26.21	232 53 14.44	4.5965347
Hell Roaring	179 57 47.07	359 57 46.29	4.5150730
Ewing	206 31 13.33	26 41 59.63	4.5929986
Cross	232 19 53.73	52 29 34.08	4.3000841
Newton	242 25 12.51	62 36 15.35	4.3069562
Scotchman	347 40 26.39	167 46 40.40	4.6847536

HELL ROARING, KOOTENAI COUNTY, IDAHO.

Station is on southern end of eastern one of two round peaks at head of Hell Roaring Creek, which flows into creek at Round Prairie. (A high rocky summit is situated to the south.) It can be reached from Bonners Ferry, Idaho, by Wild Horse trail, 27 miles to Round Prairie. From the latter place a trail runs south up Hell Roaring Creek to summit of mountain.

Station mark: Copper bolt in solid rock, above which is a rock cairn 4½ feet high.

[Latitude, 48° 54' 30.02". Longitude, 116° 13' 19.18".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Mooyie, monument	173 10 30.25	353 09 44.78	4.01339
Border	182 36 16.26	2 36 33.65	4.01348
Ewing	262 28 39.26	82 39 27.78	4.2471106
Cross	322 24 20.27	142 34 02.70	4.4137728
Doust	359 57 46.29	179 57 47.07	4.5150730

MOOYIE TRAIL MONUMENT.

On or near the boundary line between Kootenai County, Idaho, and British Columbia, about 32 miles northward from Bonners Ferry. Easily reached by the new Wild Horse trail, 5 miles from Round Meadows or Prairie. Monument is about half a mile beyond a portion of trail filled with loose rocks and just beyond a heavy growth of timber and underbrush. Where the trail crosses the international boundary is a large tree squared about 4 feet above the ground. On south side of tree are cut letters U. S.; on north side B. C. Monument is west of this tree.

Station mark: Copper bolt sunk in soil, over which is an international boundary monument and tree 20 feet in height.

[Latitude, 49° 00' 01.51". Longitude, 116° 14' 19.48".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Border	267 48 09.25	87 49 12.16	3.22930
Hell Roaring	353 09 44.78	173 10 30.25	4.01339

BLUE, KOOTENAI COUNTY, IDAHO.

Station on southeasternmost of three summits of nearly same height, 5½ miles west of Sand Point, on Great Northern Railway, 7 miles west

of Sand Point, on Northern Pacific; eight hours' travel from Carr's ranch, on Rider Creek, passing "Old Baldy;" thence along ridge.

Station mark: Copper bolt in solid rock, over which is a rock cairn 5 feet in height.

[Latitude, $48^{\circ} 24' 01.52''$. Longitude, $116^{\circ} 38' 55.78''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Doust	232 53 14.44	53 12 26.21	4.5965347
Newton	236 01 09.17	56 31 23.44	4.7758946
Scotchman	299 03 30.80	119 28 52.14	4.6825857
Blacktail	343 00 37.10	163 06 22.39	4.5152727

WASHINGTON.

Primary triangulation in central Washington was extended northward from Reeser, Stuart, and Manastash stations in the expansion of the Ellensburg base; 6 new stations were occupied by Mr. A. H. Sylvester during July, August, and September, 1898.

FROST, KITTITAS COUNTY.

A comparatively high, round, grassy hill, lying between the heads of the Taneum and the north fork of the Manastash creeks. The station can be reached with pack train from Ellensburg by wagon road and trail by following the old Natchez Pass trail along the ridge between Taneum and Manastash creeks. The point lies just north of the trail and just west of Frost Creek.

Station mark: Aluminum bolt set in solid rock.

[Latitude, $47^{\circ} 03' 43.33''$. Longitude, $120^{\circ} 59' 38.77''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Snoqualmie	144 17 34.02	323 59 04.21	4.7342558
Stuart	188 50 06.11	8 54 15.62	4.6656807
Reeser	243 23 53.86	63 41 46.92	4.5373822
Manastash	296 41 43.43	116 56 15.33	4.4505253

COLUMBIA, SNOHOMISH COUNTY.

A peak at the head of Seventysix Creek. It is reached by trail up that creek, passing over divide at head of Silver Creek. This divide is the end of horse travel. From here it is a two hours' climb up the backbone of the ridge.

Station mark: Copper bolt set in solid rock, over which is a mound of rocks 6 feet high, 4 feet in diameter.

[Latitude, 47° 57' 35.85". Longitude, 121° 21' 30.69".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Snoqualmie	4 16 12.24	184 13 44.90	4.7484469
Index	15 25 24.62	195 22 06.58	4.3224255
Pilchuck	108 24 15.31	288 04 47.67	4.5351034
Stuart	327 20 55.27	147 41 17.18	4.8068706

SNOQUALMIE, KING COUNTY.

Snoqualmie Mountain lies 2½ miles directly north of Snoqualmie Pass, in sight from the wagon road. From the wagon road, one-half mile west of summit in road, a horse trail leads up to the west fork of the Snoqualmie River to a miner's cabin at the foot of the peak. The distance from this point to the summit is 3,000 feet, and the road is over rocks and through brush. The station is on the highest and most western point of the mountain.

Station mark: Bronze tablet, marked U. S. G. S. Δ, set in solid rock, above which is a monument of stone 7 feet high.

[Latitude, 47° 27' 26.55". Longitude, 121° 24' 49.87".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Index	177 41 01.12	357 40 10.00	4.5520916
Stuart	267 08 40.08	87 31 23.86	4.5886655
Reeser	294 17 37.27	114 54 04.80	4.8369955
Frost	323 59 04.21	144 17 34.02	4.7342558

INDEX, SNOHOMISH COUNTY.

The station is the highest north of two peaks on the ridge between South Fork of Skykomish River and Trout Creek, about 8 miles east of Index post-office. It is reached by trail up Great Northern Railway to Doolittle's cabin, thence up south slope of mountain to base of south peak, thence around on west side up gully between two peaks, then up south slope of north peak.

Station mark: Copper bolt set in solid rock, above which is a pile of stones 6 feet high and 3 feet in diameter.

[Latitude, 47° 46' 40.00". Longitude, 121° 25' 59.09".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Pilchuck	139 01 11.46	318 45 04.67	4.6141725
Columbia	195 22 05.58	15 25 24.62	4.3224255
Stuart	309 57 12.77	130 20 51.18	4.7197239
Snoqualmie	357 40 10.00	177 41 01.12	4.5520916

PILCHUCK, SNOHOMISH COUNTY.

Station on Pilchuck Mountain, reached from Everett, Washington, by taking Everett and Monte Cristo Railway to the east end of bridge over Stillaguamish River, a local stopping point 2 miles east of Robe. Eight hours' climb on foot from here.

Station mark: Copper bolt in solid rock, surmounted by a stone monument.

[Latitude, 48° 03' 23.33". Longitude, 121° 47' 41.71".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Columbia	288 04 47.67	108 24 15.31	4.5351034
Index	318 45 04.67	139 01 11.46	4.6141725
Stuart	313 40 07.53	134 19 53.57	4.9698365
Snoqualmie	336 38 35.06	156 55 30.64	4.8602206

OREGON.

Triangulation in eastern Oregon was extended 75 miles westward from stations in the expansion of the Baker base, so as to control all the area in which there is mining development. Nine stations were occupied and 7 secondary stations located by intersections. The field work was executed by Mr. S. S. Gannett during August and September, 1898. Average closure error of triangles, 3.0".

BLACK, BAKER COUNTY.

Situated on a ridge about 6 miles southeast of McEwen, and 2 miles north-northwest of where the Burnt River road crosses the mountain in T. 11 S., R. 38 E. The summit is nearly bald, there being only a few scattering trees on the northern end.

Station mark: Bronze tablet cemented in rock, above which is a rock cairn, 5 feet in diameter and 5 feet in height.

APPENDIX TO DIRECTOR'S REPORT.

[Latitude, 44° 37' 53.79". Longitude, 118° 00' 16.89".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Strawberry	58 14 08.19	237 44 10.12	4.8254494
Dixie	84 02 43.89	263 36 28.53	4.6968555
Greenhorn	101 55 47.36	281 32 14.21	4.6553170
Elkhorn	164 09 32.68	344 06 32.11	4.3150920
Magpie	204 06 51.39	24 15 09.78	4.5793722
Lone Pine	236 51 48.67	57 02 56.60	4.3970158

BALDY, BAKER-GRANT COUNTIES.

(Not occupied.) Thirteen miles by road and trail northwest of Sump-ter. The summit is a long rocky ridge, the highest point of which is surmounted by two immense boulders.

Station mark: A bronze tablet cemented in the rock at south base of the north boulder.

[Latitude, 44° 50' 14.84". Longitude, 118° 19' 19.19".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Elkhorn.....	278 41 18.3	98 51 42.6	4.294216
Black	312 11 39.0	132 25 02.9	4.531291

GREENHORN, GRANT COUNTY.

A well-known mountain in T. 10 S., R. 34 E., about 4 miles by road and trail west of Robinsonville. The summit consists of a rocky back-bone, the station being located on the northern extremity.

Station mark: Copper bolt cemented in solid rock, above which is a rock cairn 7 feet in diameter and 6 feet in height.

[Latitude, 44° 42' 51.70". Longitude, 118° 33' 46.89".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Strawberry.....	15 26 37.25	195 20 07.05	4.6658137
Dixie	19 29 19.92	199 26 35.95	4.1883210
Fields.....	53 16 01.50	232 46 42.57	4.8409415
Long.....	82 09 42.53	261 49 19.47	4.5874058
Elkhorn.....	254 21 16.25	74 41 50.93	4.6021936
Black	281 32 14.21	101 55 47.36	4.6353170

DIXIE, GRANT COUNTY.

A bald, rounded dome, 7 miles (air line) west of Austin post-office, 10 miles (air line) northeast of Prairie City. It can be reached from the wagon road on Dixie Creek, leaving Comer post-office by a graded mining road up the ridge in a northeasterly direction, then following leading ridge northward, then eastward to the station, three hours' ride from Comer.

Station mark: Copper bolt cemented in solid rock, above which is a rock cairn, 7 feet in diameter and 7 feet in height.

[Latitude, $44^{\circ} 35' 00.44''$. Longitude, $118^{\circ} 37' 40.21''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Strawberry.....	13 22 59.47	193 19 13.09	4.4907164
Fields.....	61 51 09.39	241 24 35.94	4.7570659
Long.....	105 34 17.42	285 16 39.67	4.5370063
Greenhorn.....	199 26 35.95	19 29 19.92	4.1883210
Elkhorn.....	239 50 18.70	60 13 36.09	4.7032322
Black.....	263 36 28.53	84 02 43.89	4.6968555

STRAWBERRY, GRANT COUNTY.

The highest mountain in the southeastern portion of the county, 10 miles south of Prairie City, at the head of Strawberry Creek, easily ascended by a direct but steep trail on the north side. From Prairie City follow wagon road up Strawberry Creek to Mr. Street's ranch, thence follow wood road up the hollow $1\frac{1}{2}$ miles to a "burn" leading up to the main ridge, thence up the main ridge to the summit. Station is at the southern end of the summit, which is covered with shaly rock.

Station mark: Copper bolt cemented in rock, above which is a rock cairn 6 feet in diameter and 6 feet in height.

[Latitude, $44^{\circ} 18' 44.72''$. Longitude, $118^{\circ} 43' 03.48''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Fields.....	94 06 15.10	273 43 31.37	4.6369569
Long.....	146 28 49.47	326 15 00.78	4.6736986
Dixie.....	193 19 13.09	13 22 59.47	4.4907164
Greenhorn.....	195 20 07.05	15 26 37.25	4.6658137
Elkhorn.....	222 25 36.41	42 52 37.29	4.8764545
Black.....	237 44 10.12	58 14 08.19	4.8254494

CANYON, GRANT COUNTY.

(Not occupied.)
A high, bare, rocky peak, about 5 miles (air line) southeast of Canyon; at head of Dog Creek and Dean Creek from the north and Canyon Creek on the south. From Canyon City follow wagon road eastward through Marysville, thence wood road up Dog Creek, thence by trail southeastward on to a ridge leading to summit.
Station mark: Copper bolt cemented in solid rock, above which is a rock cairn 6 feet in height.

[Latitude, 44° 20' 14.73". Longitude, 118° 53' 28.90".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Dixie	217 24 05.0	37 35 09.5	4.537277
Strawberry	231 16 34.8	101 23 51.8	4.156249

BEECH, GRANT COUNTY.

(Not occupied.)
A sharp rocky peak near the head of the south fork of Long Creek and the head of Beech Creek. About 12 miles (air line) north-north-west of John Day. It can be reached from the John Day-Long Creek wagon road by leaving the road 8 miles north of John Day, where it first reaches Beech Creek, and riding northeastward up leading ridges to station.
Station mark: Copper bolt cemented in highest point of lava rock.

[Latitude, 44° 34' 40.48". Longitude, 118° 58' 39.54".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Greenhorn	245 06 27.5	65 23 56.5	4.558955
Dixie	268 36 17.9	88 51 01.8	4.443876

LONG, GRANT COUNTY.

On highest point of mesa, 5 miles southeast of Long Creek and 6 miles east-northeast of Fox post-office; summit slopes toward east, south, and west; steep on north side. Best reached from Fox post-office. Summit nearly cleared of timber.
Station mark: Hole, 1 inch in diameter and 2½ inches deep drilled in flinty rock, on north side of scrubby tree used as signal; above hole is a rock cairn 3 feet in height.

TRIANGULATION AND SPIRIT LEVELING.

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[Latitude, $44^{\circ} 39' 57.16''$. Longitude, $119^{\circ} 02' 45.99''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Fields	25 08 58.54	204 59 59.38	4.6030953
Greenhorn	261 49 19.47	82 09 42.53	4.5874058
Dixie	285 16 39.67	105 34 17.42	4.5370063
Strawberry	326 15 00.78	146 28 49.47	4.6736986

FIELDS, GRANT COUNTY.

On the highest bald summit at the head of Fields Creek; 10 miles southwest of Mount Vernon post-office and 7 miles south of John Day River. Follow trail up Fields Creek 8 miles, thence up steep ridge to left, leading to station. Best approached from the southwest side, as the ridges on the north side are very steep and rocky.

Station mark: Copper bolt cemented in solid rock, above it a rock cairn 5 feet in height.

[Latitude, $44^{\circ} 20' 20.60''$. Longitude, $119^{\circ} 15' 35.18''$.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Long	204 59 59.38	25 08 58.54	4.6030953
Greenhorn	232 46 42.57	53 16 01.50	4.8409415
Dixie	241 24 35.94	61 51 09.39	4.7570659
Strawberry	275 43 31.37	94 06 15.10	4.6360569

SOUTHERN CALIFORNIA.

The positions of the following triangulation stations in Riverside and San Bernardino counties, California, were determined by Mr. A. H. Sylvester in 1898, and are dependent upon Box Springs and Elsinore stations, established by Mr. A. P. Davis in 1892:

EL TORO, RIVERSIDE COUNTY, CALIFORNIA.

Situated on the most easterly and highest summit of the mountain; reached from San Jacinto City by wagon road to Santa Rosa Indian Reservation, via Kenworthy post-office and Van de Vanter's ranch.

Station mark: Copper bolt set in solid rock, surmounted by a rock cairn 9 feet in height.

Reference mark: An arrowhead cut on flat rock south of bolt; distance, 10 feet.

[Latitude, 33° 31' 19.26". Longitude, 116° 25' 37.12".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Cahuilla	101 25 07.57	281 13 17.71	4.5288766
San Jacinto	144 00 15.50	323 51 49.46	4.6015521

SAN JACINTO, RIVERSIDE COUNTY, CALIFORNIA.

On the highest point of this well-known mountain, which is best reached from San Jacinto City or Hemet by wagon road to Strawberry Valley, thence by trail through the pass between Tanquish Peak and San Jacinto Peak, around the east face of the latter to a small valley lying directly under and east of the station. A trail leads from here directly to the top.

Station mark: A rock monument 10 feet in height.

[Latitude, 33° 48' 47.51". Longitude, 116° 40' 49.91".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Cahuilla	20 28 55.25	200 25 29.07	4.4375670
Lakeview	83 55 50.27	263 41 18.45	4.6080880
Box Springs.....	106 29 24.18	286 09 17.56	4.7630346
Kitching	164 32 11.58	344 30 08.53	4.3270049
El Toro	323 51 49.46	144 00 15.50	4.6015521

KITCHING PEAK, SAN BERNARDINO COUNTY, CALIFORNIA.

In T. 2 S., R. 2 E., sec. 14, 10 miles northeast of the town of Banning, on the Southern Pacific Railroad. It is the first well-defined peak north of the San Gorgonio Pass, between the two north and south canyons of Millard on the west and Whitewater on the east. It is reached from Banning by taking the road past the Indian Reservation through the Millard Canyon and 2 miles past the Millard homestead to a camping place, thence by trail 3 miles to station.

Station mark: A bottle packed with charcoal at the base of a small lone live oak tree.

[Latitude, 33° 59' 51.63". Longitude, 116° 44' 30.50".]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Lakeview	54 26 30.74	234 13 59.81	4.6294059
Box Springs.....	85 21 56.11	265 03 49.89	4.6995267
San Jacinto	344 30 08.53	164 32 11.58	4.3270049

CAHUILLA, RIVERSIDE COUNTY, CALIFORNIA.

On a high mountain at the west side of the Cahuilla Valley, 20 miles southeast of the town of San Jacinto. It is best reached by going up the San Jacinto River on the new grade to Thomas's ranch, thence to Tripp's ranch, thence by trail 4 miles to station.

Station mark: A copper bolt set in solid rock, above which is a rock cairn 6 feet high.

[Latitude, $33^{\circ} 34' 54.58''$. Longitude, $116^{\circ} 47' 01.53''$.]

To station.	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Elsinore	92 28 42.17	272 10 05.55	4.7166971
Lakeview	124 44 23.43	304 33 20.32	4.5733826
San Jacinto	200 25 29.07	20 28 55.25	4.4375670
El Toro	281 13 17.71	101 25 07.57	4.5288766

LAKEVIEW, RIVERSIDE COUNTY, CALIFORNIA.

Situated on the eastern end of a ridge 6 miles east southeast of the town of Lakeview. It can be reached from the town by driving east through Juniper Canyon to Mr. George's place, on the Juniper Flats, thence one-fourth mile beyond Mr. Peck's cabin.

Station mark: A copper bolt in a large boulder.

[Latitude $33^{\circ} 46' 25.54''$. Longitude, $117^{\circ} 06' 57.36''$.]

To station.	Azimuth.	Back azimuth.	Log. distance.
	° ' "	° ' "	Meters.
Elsinore	47 54 29.34	227 46 53.19	4.4559623
Santiago	79 38 29.13	259 24 30.62	4.5967840
Box Springs	143 27 28.06	323 21 55.55	4.4104388
Strawberry	107 43 50.87	347 39 50.03	4.7149038
Butler	190 27 37.81	10 31 13.34	4.7347592
Kitching	234 13 59.81	54 26 30.74	4.6294059
San Jacinto	263 41 18.45	83 55 50.27	4.6080880
Cahuilla	304 33 20.32	124 44 23.43	4.5733826

SPIRIT LEVELING.

During the last field season careful spirit leveling was continued in connection with the regular topographic work, on the same general plan followed the two preceding seasons, as described in the Eighteenth Annual Report of the Director, Part I, 1897, pp. 225-235.

The practice of stamping an initial datum letter or name on the bench marks has been continued, and in cases where the datum has been changed on account of better determination of the reference to sea level such changes are noted in the list of elevations which follows:

The following table shows the distribution of leveling parties, localities of work, length of closure circuits in miles, with their closure errors in feet, and names of levelmen:

Localities of work, lengths of closed circuits, closure errors, and levelmen.

State.	Datum.	Length of circuit.	Closure error.	Levelman.
ATLANTIC SECTION.				
		<i>Miles.</i>	<i>Feet.</i>	
New York.....	Oswego.....	30	0.119	C. H. Semper.
Do.....	do.....	20	0.002	Do.
Do.....	do.....	48	0.369	C. H. Semper and D. E. Baxter.
Do.....	do.....	30	0.088	C. H. Semper.
Do.....	do.....	36	0.004	Do.
Do.....	do.....	38	0.169	D. E. Baxter.
Do.....	do.....	8	0.210	Do.
Do.....	do.....	13	0.030	Do.
Do.....	do.....	45	0.146	Do.
Do.....	Dunkirk.....	28	0.050	W. W. Gilbert.
Do.....	do.....	31	0.011	Do.
Do.....	do.....	15	0.126	Do.
Do.....	Albany.....	33	0.084	Do.
Do.....	do.....	33	0.101	Do.
Do.....	do.....	14	0.003	Do.
Do.....	do.....	24	0.087	Do.
Do.....	do.....	54	0.140	Do.
Do.....	Dunkirk.....	48	0.168	E. L. Faison.
Do.....	do.....	31	0.029	Do.
Do.....	Albany.....	33	0.054	C. Brown.
Do.....	do.....	47	0.226	Do.
Do.....	do.....	36	0.068	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelman.
ATLANTIC SECTION— continued.		<i>Miles.</i>	<i>Fest.</i>	
New York.....	Albany	33	0.019	C. Brown.
Do	do	25	0.032	Do.
Do	do	11	0.051	Do.
Do	do	36	0.083	Do.
Do	do	33	0.029	Do.
Do	do	52	0.017	W. W. Gilbert.
Do	do	34	0.272	C. Brown.
Do	do	35	0.704	Do.
Do	do	15	0.672	Do.
Do	do	49	0.087	Do.
Do	do	33	0.014	Do.
Do	do	61	0.100	C. H. Semper.
Do	do	40	0.046	Do.
Do	do	92	0.403	Do.
Do	do	54	0.011	Do.
Do	do	87	0.316	Gilbert, Semper.
Do	do	148	0.428	Gilbert, Semper, Brown, McNair.
Do	Oswego	25	0.116	Semper, Baxter.
Do	do	48	0.369	Do.
Alabama	Anniston	19	0.056	Wood, Moore.
Maryland	Cumberland	33	0.230	H. Wood.
Do	do	14	0.026	Do.
Do	do	73	0.063	Do.
Do	do	33	0.340	Bailey.
Do	do .....	.....	0.557	Wood, Bailey.
CENTRAL SECTION.				
Kansas	Garden City	24	0.133	M. C. McFarlane.
Iowa-Wisconsin ..	Dubuque	42	0.170	G. W. Zorn.
Do	do	30	0.023	Do.
Do	do	29	0.316	F. C. French.
Do	do	30	0.0005	Do.
Nebraska	Sidney	94	0.309	C. E. Hewitt.
Do	do	78	0.043	Do.
Do	do	56	0.217	Do.
Do	do	46	0.112	Do.
Missouri-Illinois..	St. Charles	45.9	0.217	Jesse L. Holman and Charles La Rue.
Do	do	18	0.137	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelman.
CENTRAL SECTION— continued.		<i>Miles.</i>	<i>Feet.</i>	
Missouri-Illinois..	St. Charles	22	0.112	Jesse L. Holman and Charles La Rue.
Do	do	41	0.274	Do.
South Dakota- Nebraska.	Yankton	52	0.425	D. C. Wray.
Do	do	42	0.797	Do.
Do	do	12	0.010	Do.
Do	do	56	0.851	Do.
Wisconsin	Baraboo	40	0.264	Do.
Do	do	42	0.248	Do.
Do	do	6	0.088	Do.
Ohio-Kentucky ...	Cincinnati	42	0.011	Ralph W. Stewart.
Do	do	29	0.217	Do.
Do	do	20	0.075	Do.
Do	do	37	0.283	Do.
Do	do	23	0.078	Do.
Michigan	Iron Mountain ..	9	0.12	Jesse L. Holman.
Do	do	12	0.11	Do.
Do	do	21	0.18	Do.
Do	do	15	0.13	Do.
Arkansas	Rudy	30	0.820	Robert Coe.
Do	do	50	0.109	Do.
Do	do	24	0.770	Do.
Do	do	43	0.195	Do.
Do	do	28	0.024	Do.
ROCKY MOUNTAIN SECTION.				
South Dakota	Deadwood	18	0.110	J. T. Stewart.
Do	do	40	0.101	Do.
Do	do	27	0.165	Do.
Do	do	31	0.036	Do.
Do	do	21	0.182	Do.
Do	do	13	0.066	Do.
Do	do	34	0.044	Do.
Do	do	40	1.182	Do.
Wyoming	Sheridan	32	0.551	E. W. Glafcke.
Do	do	17	0.511	Do.
Do	do	6	0.44	Do.
Do	do	10	0.039	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelman.
ROCKY MOUNTAIN SECTION—cont'd.		<i>Miles.</i>	<i>Feet.</i>	
Wyoming	Sheridan	29	0.071	E. W. Glascke.
Do	do	6	0.015	Do.
Do	do	12	0.120	Do.
Do	do	30	0.231	Do.
Do	Evanston	125	0.492	C.E. Worthington.
Utah	Missoula	84	0.482	E. O. Hills.
Montana	Durango	3	0.018	F. B. Whitlock.
Colorado	do	35	0.358	Thomas Winsor.
Do	San Antonio	35	0.207	Do.
Texas	do	48	0.099	Do.
Do	do	42	0.310	Do.
Do	do	11	0.100	Do.
Do	do	50	0.336	Do.
Do	do	46	0.079	Do.
Do	do	17	0.205	Do.
Do	do	45	0.391	Do.
Do	do	46	0.335	Do.
Do	do	19	0.256	Do.
Do	do	6	0.021	Do.
Do	do	18	0.857	Do.
Do	do	52	0.164	Do.
PACIFIC SECTION.				
Washington	Chelan Falls	45	0.293	Ed M. Fry.
Do	do	25	0.012	Do.
Do	do	16	0.019	Do.
Do	Tacoma	13	0.013	H. K. Kalloch.
Do	do	26	0.071	Do.
Do	do	56	0.233	Do.
Do	do	27	0.075	Do.
Do	do	53	0.261	Do.
Do	do	3	0.004	Do.
Do	do	14	0.081	Do.
Do	do	35	0.056	Do.
Do	do	450	0.786	L. D. Ryns, P. F. Byrne, Ed. M. Fry, H. K. Kal- loch, and H. S. Crowe.
Do	Spokane	31	0.122	J. H. Carlock.
Do	do	20	0.009	Do.
Do	do	71	0.133	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelman.
PACIFIC SECTION— continued.		Miles.	Fect.	
Washington.....	Spokane	29	0.108	J. H. Carlock.
Do	do	25	0.132	Do.
Do	do	31	0.550	Do.
Do	do	34	0.140	Do.
Do	do	21	0.040	Do.
Do	do	29	0.108	Do.
Do	do	48	0.243	Do.
Do	Tulalip	102	0.502	L. D. Ryus.
Do	do	95	0.274	Do.
Oregon.....	Baker City	28	0.747	W. R. Manning.
Do	do	34	0.031	Do.
Do	do	51	0.667	Do.
Do	do	18	0.235	Do.
California.....	San Bernardino	28	0.175	C. R. Smith.
Do	do	21	0.419	Do.
Do	do	19	0.158	Do.
Do	do	32	0.186	Do.
Do	do	11	0.021	Do.
Do	do	31	0.087	Do.
Do	do	13	0.038	Do.
Do	do	33	0.185	Do.
Do	do	100	0.339	Do.
Do	San Pedro.....	77	0.082	G. H. Herrold.
Do	do	4	0.008	Do.
Do	San Pedro and San Diego.	195	0.409	Do.
Do	Oakland	30	0.188	C. R. Smith.
Idaho	Priest River Sta- tion.	43	0.066	W. R. Prowell.

In the following list are published only those elevations which have been adjusted and checked in closed circuits. In addition to the list here published, much work has been done, especially in mountainous regions, which it is thought inadvisable to publish at this time on account of the many lines which were left unchecked at the end of the field season, and also on account of errors of closure in a few circuits in excess of the limiting error allowed by the formula $0.05\sqrt{\text{distance in miles}}$. These lines in most cases will be rerun to bring them within the required limit.

ATLANTIC SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. H. M. Wilson, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in the various localities, as follows:

NEW YORK.

Errata in previous reports.

All elevations published in the Appendix to Part I of the Eighteenth Annual Report for Utica quadrangle have been revised and rearranged for publication herewith. They are now reduced to the United States Engineer Corps bench mark at Little Falls, instead of to the elevations of the Erie Canal, and in consequence the elevation of the copper bolt in the Utica post-office building, instead of being 417.516, as published in the Eighteenth Annual Report, is now accepted as being 416.788 feet above mean sea level.

All elevations between Fonda and Speculator, as published in the Eighteenth Annual, and those between Cedar River House and Wakeley Dam, have been revised and readjusted for publication herewith, as a result of additional circuit closures procured during the last field season. All other elevations published in the Eighteenth Annual for Indian Lake, Thirteenth Lake, Newcomb, and Blue Mountain quadrangles should have applied to them a fixed correction of 0.306 foot, to be added to the elevations as published in the Eighteenth Annual. The above is set forth in detail hereafter under the name of the appropriate quadrangle.

As a result of the same adjustment of circuits in the southwestern Adirondacks, all elevations published in the Nineteenth Annual for Remsen and Wilmurt quadrangles have been revised and rearranged for publication herewith. The datum of levels run in 1896 from Woodhull Lake to Bisby lodge and Canachagala stillwater is in doubt. In 1898 a bench mark was established in the trail or road leading to Woodhull Lake and about a mile therefrom. A tie can therefore easily be made to the levels at Woodhull Lake.

There was an error discovered during the running of levels in 1896 in the Moravia quadrangle. These elevations are published in the Eighteenth Annual Report for Auburn, Skaneateles, and Moravia quadrangles. The elevations run during the last field season in Chemung and Dryden quadrangles are adjusted to the precise levels run during this season, and are carried northward from Waverly to McLain, in the southeastern portion of Moravia quadrangle. There they differ from the levels published in the Eighteenth Annual Report by 1.6 feet, due to a known error on the circuit in Moravia quadrangle.

The elevations as published in the Eighteenth Annual for the Olean quadrangle are to be reduced by 6.521 feet, which is to be subtracted

from such published elevations. This is the result of the adjustment to mean sea level of the elevation of bronze tablet at Olean, now accepted as 450.937 feet, as dependent on the line of precise levels run during this season.

Precise levels.

ALBANY, SCHENECTADY, SCHOHARIE, OTSEGO, BROOME, TIoga, CHEMUNG, STEUBEN, ALLEGANY, CATTARAUGUS COUNTIES.

COHOES, SCHENECTADY, AMSTERDAM, SCHOHARIE, DECATUR, COOPERSTOWN, ONEONTA, UNADILLA, NINEVEH, BINGHAMTON, APALACHIN, OSWEGO, CHEMUNG, ELMIRA, CORNING, CAMERON, HORNELLSVILLE, WELLSVILLE, BELMONT, OLEAN, SALEM, SALAMANCA, GOWANDA, CHERRY CREEK, AND DUNKIRK QUADRANGLES.

The elevations in the following list are the result of a line of precise levels run during the field season of 1898. These were run from Dunkirk to Binghamton over the line of the Erie Railway and from Binghamton to Cohoes over the line of the Delaware and Hudson Canal Company's Railway. Between Dunkirk and Elmira they are based on the top of water table of Nelson Block, Dunkirk, and all bench marks in this portion of the line are marked with the letter "D 1898" in addition to their figures of elevation, thus referring them to the Dunkirk datum. The bench marks established between Cohoes and Elmira are based on the old gristmill bench mark at Albany, and are marked with the letter "A 1898" in addition to the figures of elevation, thus referring them to Albany as a datum.

The elevation of the initial bench mark at Dunkirk was originally based on a datum furnished by the United States Engineers as obtained through their line of precise levels from gristmill bench mark to Oswego and thence by water levels on Lakes Ontario and Erie to Dunkirk. This was based on mean low water at Albany, but reduced, in accordance with memoranda published on page 203 of the Nineteenth Annual Report to mean sea level at Sandy Hook, resulting in the height 587.805 feet above mean sea level.

The closure error on the full circuit of levels from Cohoes to Oswego and by water levels to Dunkirk through the work of the United States Engineers and back from Dunkirk to Cohoes through our own work a total distance of approximately 780 miles was 0.645 foot.

The differences of elevation between the various bench marks of the precise work of this survey, as shown by the duplicate rodded lines, was very small. The final divergence between the two lines which were carried respectively from Dunkirk and from Cohoes to Elmira being -0.196 foot for the direct line going eastward and $+0.224$ foot for the direct line going westward, making the total divergence between the direct and reverse lines -0.420 foot for the direct line. This divergence is far within the limit set for precise leveling.

As a result of the above, this new line of precise levels is assumed to be more accurate than that run by the United States Engineers, with

less exact methods, in 1875. In adjusting these levels it has therefore been decided to give this line the arbitrary weight of two-thirds, and to give the United States Engineers' line the weight of one-third. The result is to make the elevations of the Dunkirk bench mark 588.235 feet above mean sea level, which is accepted as final, this amount being 0.430 foot higher than that determined by the United States Engineers. This small amount of closure error has been distributed by mileage uniformly throughout by the line of levels run by this Survey.

The precise leveling was executed by Mr. E. L. McNair, levelman, assisted by Messrs. W. F. Hammond and J. E. Buford, rodmen. The work was performed with the same Buff and Berger precise level as has been used in previous years and described in previous reports, the rods being of two kinds, both double targeted and speaking rods being employed.

ERIE RAILROAD: DUNKIRK TO ELMIRA.

	Feet.
Dunkirk, St. Mary's Home and School, Washington avenue, between Third Fourth streets; in water table 20 feet from northeast corner; aluminum tablet marked "598—Dunkirk—1899"	598.305
Dunkirk, Nelson Block, extreme northwest corner of; top of water table. (NOTE.—This temporary R. M. is 16.03 feet above mean level of Lake Erie.)	588.235
Dunkirk, 1½ miles east of Nelson Block; top of rail at crossing of Erie and New York, Chicago and St. Louis Railway (Nickel Plate)	618.2
Dunkirk, 2.1 miles east of Nelson Block; top of rail under private overhead crossing	648.5
Sheridan, 1½ miles west of; top of rail at center of iron bridge over highway	685.4
Sheridan, 1.1 miles west of; top of rail at center of iron bridge over highway	710.9
Sheridan, ½ mile west of; top of rail at center of iron bridge over highway	733.1
Sheridan, 0.4 mile west of; top of rail at center of iron bridge over private road	741.0
Sheridan, 850 feet west of; top of rail in center of iron bridge over private road	749.9
Sheridan; top of rail opposite Erie station	757.6
Sheridan, 1,850 feet east of; top of rail at highway crossing	771.6
Sheridan, 1½ miles east of; top of rail under overhead highway crossing	816.3
Forestville, 530 feet west of entrance in waiting room of Erie station; in bridge seat at northeast corner of iron bridge over highway; 7 feet north of center of track; bronze tablet marked "871 D"	871.216
Forestville; top of rail opposite Erie station	874.8
Forestville, 0.7 mile east of; top of rail at center of iron bridge over highway	887.9
Forestville, 1 mile east of; top of rail at center of iron bridge over ravine	903.3
Forestville, 1.9 miles east of; top of rail at road crossing	934.2
Smiths Mills, 0.9 mile west of; top of rail at road crossing	976.3
Smiths Mills, top of rail opposite center of Erie station	1,010.0
Smiths Mills, 2.3 miles east of; 10½ feet north of center of railway track in foundation stone under west end of overhead highway bridge; bronze tablet marked "1097 D," 1898	1,097.927

	Feet.
Smiths Mills, 3.15 miles east of; top of rail at road crossing	1, 126. 7
Perrysburg, 3 miles west of; top of rail at road crossing.....	1, 153. 4
Perrysburg, 2 miles west of; top of rail at road crossing.....	1, 195. 2
Perrysburg, 1.2 miles west of; top of rail at road crossing.....	1, 215. 8
Perrysburg, top of rail opposite center of Erie station at.....	1, 264. 4
Perrysburg, Erie station at; 400 feet east of waiting room, in keystone at north end of stone arch culvert under railway; bronze tablet marked "1261 D".....	1, 261. 695
Perrysburg, 1.9 miles east of; top of rail at road crossing	1, 323. 8
Dayton, 0.35 mile west of; top of rail at road crossing.....	1, 326. 0
Dayton, Erie station at; 950 feet north of; 37½ feet east of center of track; coping of tunnel underneath Erie track; second stepstone from top; bronze tablet marked "1322 D".....	1, 322. 190
Dayton, top of rail at Erie station at.....	1, 336. 4
Dayton, 0.9 mile east of; top of rail at road crossing.....	1, 358. 4
Dayton, 1½ miles east of; top of rail at road crossing.....	1, 380. 9
Dayton, 3 miles east of; top of rail at road crossing.....	1, 338. 4
Dayton, 4 miles east of; top of rail at road crossing.....	1, 323. 3
Cattaraugus, Union school building at; in water table at right of main entrance to; bronze tablet marked "1401 D".....	1, 384. 851
Cattaraugus; top of rail at Erie station	1, 414. 4
Cattaraugus, ¼ mile east of; top of rail at road crossing	1, 446. 0
Cattaraugus, 1½ miles east of; top of rail at road crossing.....	1, 477. 0
Little Valley, 4.6 miles west of; top of rail at road crossing	1, 532. 0
Little Valley, 2¼ miles west of; top of rail at road crossing.....	1, 601. 2
Little Valley, 1.6 miles west of; top of rail at road crossing.....	1, 590. 7
Little Valley, ¼ mile west of; top of rail at road crossing.....	1, 582. 5
Little Valley, Cattaraugus County court-house at; foundation wall at southwest corner of; aluminum tablet marked "1593 D"	1, 593. 428
Little Valley, Erie station at; top of rail.....	1, 565. 7
Little Valley, ¼ mile east of; top of rail at road crossing.....	1, 541. 5
Elkdale station, top of rail at.....	1, 463. 5
Elkdale station, ¼ mile east of; top of rail at bridge No. 36.....	1, 440. 8
Salamanca, 3¼ miles west of; bridge seat of iron girder bridge, southwest corner of; bronze tablet marked "1413 D"	1, 412. 931
Salamanca, 2.6 miles west of; top of rail at road crossing	1, 399. 8
West Salamanca flag station, top of rail at.....	1, 371. 8
Salamanca; top of rail at Erie station.....	1, 386. 7
Salamanca, Union school building on Maple street at; in water table at right of main entrance; aluminum tablet marked "1391 Dunkirk, 1899" (Originally set in 1897 and marked "1396 S").....	1, 390. 640
Salamanca, 0.8 mile east of; top of rail at road crossing	1, 396. 7
Killbuck; top of rail at flag station	1, 384. 8
Carrollton; top of rail at station.....	1, 390. 1
Carrollton, 475 feet east of Erie station at; west pier of Buffalo, Rochester and Pittsburg Railway iron bridge crossing over Erie tracks; bronze tablet marked "1393 D".....	1, 393. 786
Carrollton, 0.8 mile east of; top of rail at road crossing.....	1, 390. 7
Carrollton, 1.8 miles east of; top of rail at road crossing.....	1, 399. 8
Vandalia; Erie station, top of rail at.....	1, 406. 9
Vandalia, 900 feet east of Erie station at.....	1, 407. 8
Allegany, 1.8 miles west of Erie station; stone arch culvert under Erie Railroad, 75 feet east of road crossing, south end of, next to top step; bronze tablet marked "1408 D." (Originally set in 1897 and marked "1415 S").....	1, 408. 083

	Feet.
Allegany, $\frac{1}{2}$ mile west of; top of rail at road crossing	1,420.7
Allegany, 0.4 mile west of; top of rail at road crossing	1,415.3
Allegany, top of rail at Erie station at	1,414.9
Olean, 0.8 mile west of Erie station; 90 feet north of Erie track at road crossing; top of spindle of hydrant	1,417.67
Olean, 0.2 mile west of Erie station; top of rail at crossing of Western New York and Pennsylvania Railway and Erie Railroad	1,429.4
Olean, top of rail at Erie station at	1,429.5
Olean, 0.3 mile east of Erie station at; top of rail at road crossing	1,430.8
Olean, city hall and post-office building on State street at; northwest corner of; stone next under water table; bronze tablet marked "1450 D." (Originally set in 1896 and marked "1457")	1,450.937
Olean, 1 mile east of Erie station at; top of rail at road crossing	1,445.1
Olean, $1\frac{1}{4}$ miles east of; top of rail opposite milepost "J. C. 393—D. 66" ..	1,449.0
Olean, $2\frac{1}{4}$ miles east of; top of rail opposite milepost "J. C. 392—D. 67" ..	1,456.7
Olean, $3\frac{1}{4}$ miles east of; top of rail opposite milepost "J. C. 391—D. 68" ..	1,470.2
Hinsdale, 1.1 miles west of; top of outer rail at road crossing	1,481.0
Hinsdale; top of rail at Erie station	1,492.6
Hinsdale, 0.4 mile east of Erie station at; top of rail at road crossing ...	1,482.7
Hinsdale, $1\frac{1}{4}$ miles east of; top of rail at road crossing	1,493.8
Hinsdale, 2 miles east of; top of rail at road crossing	1,508.6
Hinsdale, $2\frac{1}{4}$ miles east of; bridge seat of small girder bridge, 9 $\frac{1}{2}$ feet north-west of center of track; bronze tablet marked "1508 D"	1,508.435
Cuba, $2\frac{1}{4}$ miles west of Erie station west of; top of rail opposite milepost "J. C. 385—D. 74"	1,518.8
Cuba, $1\frac{1}{4}$ miles west of; top of rail at road crossing	1,521.8
Cuba, 1 mile west of; top of outer rail of curve at road crossing	1,525.5
Cuba; top of north rail at Erie station	1,534.0
Cuba, $\frac{1}{2}$ mile east of Erie station at; south end of pier of stone arch bridge over Union street; aluminum tablet marked "1515 D." (Originally a bronze tablet set in 1896 and marked "1522")	1,515.936
Cuba, 1.1 miles east of; top of rail center of bridge crossing over highway ..	1,553.8
Cuba, $1\frac{1}{4}$ miles east of; top of rail at road crossing	1,581.7
Cuba, 2.6 miles east of; top of rail at road crossing	1,611.4
Cuba, 3 miles east of; top of rail at road crossing	1,631.3
Cuba, 4.7 miles east of; top of north rail, main track, opposite "Q X" tower. Summit of grade	1,689.6
Friendship, $3\frac{1}{2}$ miles west of; top of north rail at road crossing	1,670.3
Friendship, $2\frac{1}{4}$ miles west of; top of rail at road crossing	1,645.2
Friendship, $1\frac{1}{4}$ miles west of; top of rail at road crossing	1,600.8
Friendship, 1.6 miles west of; top of north rail at road crossing	1,594.6
Friendship, $\frac{1}{2}$ mile west of; top of rail at road crossing	1,561.5
Friendship, $\frac{1}{4}$ mile west of; top of rail at road crossing	1,548.2
Friendship; top of south rail at Erie station	1,531.2
Friendship, Union School building at; water table at right of main entrance; aluminum tablet marked "1520 D"	1,520.152
Friendship, 1.7 miles east of; top of rail center of bridge over highway ..	1,461.7
Friendship, $2\frac{1}{4}$ miles east of; top of rail at road crossing	1,427.5
Friendship, 2.85 miles east of; top of rail at road crossing	1,424.3
Belvidere, 1 mile west of; top of rail at road crossing	1,406.4
Belvidere; top of north rail at Erie station	1,377.8
Belvidere, 0.4 mile east of; top of north rail of road crossing	1,365.6
Belvidere, $\frac{1}{2}$ mile east of; south end of wing wall of abutment at east end of railway bridge over Van Campen Creek; 28 feet south of center of track; bronze tablet marked "1351 D"	1,351.392

	Feet.
Belvidere, 0.7 mile east of; top of rail at road crossing.....	1, 355. 7
Belmont, $\frac{1}{2}$ mile west of; top of rail at road crossing.....	1, 375. 1
Belmont, 0.3 mile west of; top of rail at road crossing.....	1, 381. 2
Belmont; southeast corner of Allegany County jail; in stone foundation; aluminum tablet marked "1416 D".....	1, 416. 915
Belmont; top of south rail at Erie station.....	1, 383. 9
Belmont, Erie station at; 575 feet east of; top of north rail at road crossing.....	1, 385. 5
Belmont, 2 miles east of; top of rail at road crossing.....	1, 422. 3
Belmont, 2.2 miles east of; top of north rail at road crossing.....	1, 424. 0
Scio, 2 miles west of; top of north rail at road crossing.....	1, 424. 0
Scio, $1\frac{1}{2}$ miles west of; top of north rail at road crossing.....	1, 430. 5
Scio, 1 mile west of; top of north rail at road crossing.....	1, 439. 7
Scio; top of south rail at Erie station.....	1, 453. 3
Scio, 680 feet east of Erie station at; top of north rail at road crossing...	1, 454. 2
Scio, 0.4 mile east of; top of north rail at road crossing.....	1, 455. 9
Wellsville; 0.6 mile west of Erie station; top of north rail at road crossing.....	1, 513. 5
Wellsville; top of north rail at east end of Erie station.....	1, 518. 7
Wellsville, Union School building at; northeast corner entrance; in foot- stone of arch over entrance; aluminum tablet marked "1519 D".....	1, 519. 663
Wellsville, 1.8 miles east of; top of rail at road crossing.....	1, 524. 5
Wellsville, 2 miles east of; top of rail at road crossing.....	1, 528. 2
Wellsville, 4 miles east of; top of north rail at road crossing.....	1, 544. 7
Andover, 3 miles west of; iron girder, railroad bridge No. 8, stone step of; bronze tablet marked "1573 D".....	1, 573. 358
Andover, $2\frac{1}{2}$ miles west of; top of rail at road crossing.....	1, 609. 0
Andover; top of south rail at main track opposite Erie station.....	1, 649. 4
Andover, 0.2 mile east of; top of north rail at road crossing.....	1, 656. 1
Andover, $\frac{1}{2}$ mile east of; top of north rail at road crossing.....	1, 663. 3
Andover, 2 miles east of; stone foundation at southeast corner of small railway bridge; bronze tablet marked "1675 D".....	1, 675. 256
Andover, $3\frac{1}{2}$ miles east of; top of north rail at road crossing.....	1, 725. 3
Andover, 4 miles east of; top of north rail at road crossing.....	1, 757. 0
Andover, $4\frac{1}{2}$ miles east of; top of south rail opposite water tank at Tip Top Summit.....	1, 772. 4
Alfred, 3 miles west of; top of north rail at road crossing.....	1, 766. 9
Alfred, $1\frac{1}{2}$ miles west of; top of north rail at road crossing.....	1, 694. 4
Alfred, 0.4 mile west of; top of north rail at east end of bridge No. 4 over road and creek.....	1, 627. 0
Alfred; top of north rail opposite Erie station.....	1, 606. 9
Alfred; Erie station; water table under front office window, facing track; aluminum tablet marked "1610 D".....	1, 610. 543
Alfred, 1.6 miles east of; top of north rail, center of bridge No. 2 over high- way.....	1, 525. 6
Almond; top of rail opposite center of Erie station.....	1, 394. 2
Almond; 950 feet east of Erie station; bridge foundation at northwest corner of small railroad bridge over highway; aluminum tablet marked "1383 D".....	1, 382. 066
Hornellsville; Erie station 0.6 mile; top of rail at street crossing.....	1, 170. 9
Hornellsville; top of rail opposite center of Erie station.....	1, 152. 0
Hornellsville; 0.7 mile east of Erie station; foundation wall at northeast corner of iron railroad bridge; aluminum tablet marked "1141 D".....	1, 141. 634
Hornellsville, 2.9 miles east of; top of north rail at road crossing.....	1, 133. 8
Canisteo; top of south rail opposite center of Erie station.....	1, 127. 2
Canisteo, $1\frac{1}{2}$ miles east of; top of north rail at road crossing.....	1, 124. 7
Canisteo, $1\frac{1}{2}$ miles east of; top of north rail at road crossing.....	1, 123. 9

	Feet.
Canistota, 2.1 miles east of; bridge seat of iron girder bridge No. 87, north-east corner of; aluminum tablet marked "1113 D".....	1,113.253
Adrian, top of south rail at center of Erie station.....	1,100.9
Adrian, 3.7 miles east of; in face of rock cliff on east side of Erie Railroad and highway, 400 feet northeast of highway bridge across Canistota River, 25 feet from east rail; bronze tablet marked "1080 D".....	1,080.353
Adrian, 3½ miles east of; top of north rail at road crossing.....	1,072.8
Cameron, 2½ miles west of; top of north rail at road crossing.....	1,056.6
Cameron, ¼ mile west of; top of south rail at road crossing.....	1,055.3
Cameron, top of north rail at center of Erie station.....	1,047.0
Cameron, 180 feet west of Erie station at; in stone foundation of railroad water tank; bronze tablet marked "1048 D".....	1,048.091
Cameron, ¼ mile east of; top of north rail at road crossing.....	1,041.2
Cameron Mills, top of north rail opposite center of Erie station at.....	1,032.5
Cameron Mills, 270 feet east of Erie station at; top of north rail at road crossing.....	1,032.5
Rathbone, 2½ miles west of; top of north rail at road crossing.....	1,022.1
Rathbone, 2 miles west of; top of rail at road crossing.....	1,020.0
Rathbone, ¼ mile west of; top of north rail at road crossing.....	1,008.0
Rathbone, general merchandise store of F. G. Martin (building owned by O. O. Whittemore), foundation stone at right of main entrance; bronze tablet marked "1006 D".....	1,006.228
Rathbone, top of south rail opposite center of Erie station.....	1,007.8
Rathbone, 1½ miles east of; top of north rail at road crossing.....	992.2
Addison; top of north rail of west-bound track opposite center of Erie station.....	984.7
Addison; 0.4 mile east of Erie station and 750 feet northwest of tracks; Union School building, at right of main entrance to; aluminum tablet marked "1021 D".....	1,021.748
Addison; 0.9 mile east of Erie station; top of north rail of west-bound track at road crossing.....	979.5
Erwina, 1.9 miles west of; top of north rail of west-bound track at road crossing.....	972.9
Erwins station; top of south rail of east-bound track opposite center of.	964.4
Erwina; top of north rail of west-bound track at road crossing.....	945.4
Painted Post, 0.8 mile west of; in masonry wall of open culvert, east wall of culvert and south side of railroad track; bronze tablet marked "935 D".....	935.4
Painted Post; top of south rail of east-bound track opposite center of Erie station.....	937.6
Painted Post, 0.6 mile east of; top of north rail of west-bound track at road crossing.....	936.6
Corning; top of rail opposite center of Erie station.....	935.5
Corning; city hall at corner of Erie avenue and Cedar street; foundation stone under water table at right of Cedar street entrance.....	935.969
Corning, 1½ miles east of; top of north rail of west-bound track at road crossing.....	922.4
East Corning, 1½ miles west of; top of north rail at road crossing.....	915.3
East Corning; top of south rail opposite center of Erie station at.....	908.5
Big Flats, 1½ miles west of; in bridge seat at Erie Railroad bridge No. 67A, at southwest corner of; bronze tablet marked "899 D".....	900.031
Big Flats, 0.6 mile west of; top of north rail of west-bound track in center of bridge No. 66 over highway.....	906.4
Big Flats; top of south rail of west-bound track opposite center of Erie station.....	910.0

	Feet.
Big Flats, 1 mile east of; top of south rail of west-bound track under overhead road crossing	916.9
Big Flats, 2.4 miles east of; top of north rail of west-bound track under overhead road crossing	925.8
Horseheads, $\frac{1}{4}$ mile west of; top of north rail of west-bound track at road crossing	911.6
Horseheads, $\frac{1}{4}$ mile west of; top of north rail of west-bound track at road crossing	906.5
Horseheads; top of north rail of west-bound track opposite center of Erie station	902.6
Horseheads; 0.35 miles southwest of Erie station; on pier of Lackawanna railroad bridge at crossing of Northern Central Railway, 50 feet south of center of north-bound track of Northern Central Railway; aluminum tablet marked "901 D"	901.339
Horseheads; Northern Central Railway station; northeast corner of stone doorsill of men's waiting room	899.341
Horseheads; $1\frac{1}{2}$ miles east of Erie station; top of north rail of west-bound track at road crossing	890.4
Horseheads, 2 miles east of; top of south rail of west-bound track at road crossing	880.8
Elmira, 2 miles west of; top of south rail of west-bound track at road crossing	873.6
Elmira; Erie station; top of south rail of east-bound track opposite distance board	856.5
Elmira; city hall, corner of Church and Lake streets; stone pedestal of lamp-post at left of Lake-street entrance; aluminum tablet marked "857 Albany"	857.860

DELAWARE AND HUDSON CANAL COMPANY'S RAILROAD: ELMIRA TO BINGHAMTON.

Elmira, $\frac{1}{4}$ mile east of Erie station at; + chisel mark on head of iron bolt set in stone foundation at west end of Erie railroad bridge across Chemung River. Bolt in between tracks and nearest east-bound track	853.828
Wellsburg station, 1 mile west of; top of north rail of west-bound track at road crossing	826.0
Wellsburg station, 1,800 feet west of; coping stone of abutment wall at southeast corner of bridge No. 55; aluminum tablet marked "824 A"	822.444
Wellsburg station, top of south rail of east-bound track opposite center of	824.4
Wellsburg, 1 8 miles east of; top of north rail of west-bound track at road crossing	815.9
Chemung station, 1 mile west of; coping stone of abutment wall at northeast corner of bridge No. 53 across Chemung River; aluminum tablet marked "804 A"	802.319
Chemung, top of north rail of west-bound track at center of Erie station	810.5
Waverly, $3\frac{1}{4}$ miles west of; top of south rail of west-bound track at road crossing	809.2
Waverly, 1.2 miles west of Erie station at; top of north rail of east-bound track at center of bridge crossing over road	816.8
Waverly, top of north rail of west-bound track opposite center of Erie station	829.1
Waverly, city hall building on Broad street; stone column between doorways; aluminum tablet marked "840 A"	838.582
Waverly, 1 mile east of Erie station; top of south rail of east-bound track at center of bridge crossing over Lehigh Valley Railroad	818.8

	Fest.
Waverly, 2½ miles east of Erie station at; top of north rail of west-bound track at road crossing	809.2
Waverly, 3 miles east of Erie station at; top of north rail of west-bound track at crossing over highway	804.9
Barton, 2.3 miles west of; top of north rail of west-bound track at road crossing	792.4
Barton, 1½ miles west of; top of north rail of west-bound track at road crossing	792.0
Barton; top of north rail of west-bound track opposite center of Erie station	796.8
Barton, ½ mile east of Erie station at; top of south rail of east-bound track at road crossing	796.8
Barton, 1.2 miles east of; coping stone of abutment at southeast corner of bridge No. 40; aluminum tablet marked "798 A"	796.768
Smithboro; top of south rail of west-bound track at center of Erie station	792.4
Smithboro, 0.2 mile east of Erie station; top of south rail of west-bound track at road crossing	792.2
Smithboro, 2.1 miles east of; top of north rail of west-bound track at overhead road crossing	793.7
Tioga Center, 1.1 miles west of; top of north rail of west-bound track at road crossing	793.5
Tioga Center; top of south rail of west-bound track at center of Erie station	797.0
Tioga, 2½ miles east of; top of north rail of west-bound track at road crossing	807.8
Owego, 2½ miles west of Erie station at; coping stone of abutment at southeast corner of bridge No. 37; aluminum tablet marked "815 A" ..	814.284
Owego, 1½ miles west of Erie station at; top of north rail of west-bound track at road crossing	812.0
Owego, 700 feet west of Erie station at; top of north rail of west-bound track at crossing of Ithaca branch of Lackawanna railway	815.9
Owego; top of north rail of west-bound track at center of Erie station ..	816.2
Owego, 0.8 mile east of Erie station; top of north rail of west-bound track at road crossing	813.6
Owego, 2.4 miles east of Erie station at; top of south rail of west-bound track at road crossing	814.2
Owego, 2½ miles east of Erie station at; coping stone at northwest corner of bridge No. 33; aluminum tablet marked "812 A"	810.938
Campville, 3½ miles west of; top of north rail of west-bound track at road crossing	816.4
Campville station; top of north rail opposite center of	824.2
Campville station, 1 mile east of; top of south rail of west-bound track at road crossing	827.8
Union, 1.4 miles east of; coping stone of wing wall of abutment at north-east corner of bridge No. 31, across Nanticoke Creek; bronze tablet marked "825 A"	827.618
Union station, top of south rail of east-bound track at center of	834.5
Hooper station, 1½ miles west of; top of north rail of west-bound track at road crossing	839.2
Hooper station, 1.2 miles west of; top of north rail of west-bound track at road crossing	841.5
Hooper station, top of south rail of west-bound track at	833.8
Hooper station, ½ mile east of; top of south rail of west-bound track under overhead farm crossing	833.9

	Feet.
Hooper station, 1 mile east of; top of north rail of west-bound track at road crossing	839.2
Lestershire, 1½ miles west of; top of south rail of west-bound track at center of bridge No. 27, over highway	839.3
Lestershire, 1 mile west of; top of south rail of west-bound track at center of bridge No. 26, over highway	840.5
Lestershire, top of south rail of east-bound track at Erie station at	847.4
Lestershire, 0.3 mile east of Erie station at; top of south rail of east-bound track under overhead road crossing	850.0
Binghamton station, 1.6 miles west of; top of south rail of east-bound track at road crossing	854.3
Binghamton, Broome County court-house, west end of, at left of basement, entrance from Collier street; aluminum tablet marked "867 A" ..	865.327
Binghamton station (Erie and Delaware and Hudson), top of north rail of west-bound track, opposite center of	862.8
Binghamton station, 1 mile east of top of south rail at crossing of Delaware and Hudson and Syracuse, Binghamton and New York railroads ..	851.9

DELAWARE AND HUDSON CANAL COMPANY'S RAILROAD: BINGHAMTON TO SCHENECTADY.

Binghamton station, 1½ miles east of; top of south rail at road crossing ..	866.4
Binghamton station, 2½ miles east of; top of south rail at center of bridge No. 108, over highway	898.9
Binghamton station, 3.1 miles east of; top of north rail at road crossing ..	937.3
Port Crane station, 3½ miles west of; 900 feet west of road crossing; parapet wall at east end of culvert under railway; bronze tablet marked "959 A"	957.800
Port Crane station, 3 miles west of; top of south rail at road crossing ...	976.3
Port Crane station, ½ mile west of; top of south rail at road crossing	1,040.7
Port Crane station, top of north rail at	1,041.1
Sanitaria Springs, 1.9 miles west of; top of north rail at road crossing ...	1,041.3
Sanitaria Springs station, 1.3 miles west of; top of north rail at road crossing	1,063.3
Sanitaria Springs station, ½ mile west of; top of north rail at road crossing ..	1,098.0
Sanitaria Springs station, top of north rail at	1,116.3
Sanitaria Springs station, ½ mile east of; coping stone of abutment at northeast corner of bridge No. 107 over highway; bronze tablet marked "1126 A"	1,125.914
Tunnel station, 4½ miles west of; top of north rail at road crossing	1,173.7
Tunnel station, 3½ miles west of; top of south rail over arch culvert; road passing underneath	1,232.1
Tunnel station, 1½ miles west of; top of north rail at road crossing	1,330.1
Tunnel station, ½ mile west of; coping stone of abutment at southeast corner of bridge No. 104, crossing over road; bronze tablet marked "1384 A"	1,381.311
Tunnel station, top of north rail at	1,414.5
Tunnel station, 0.4 mile east of; top of rail at west portal of tunnel	1,434.1
Tunnel station, 2.3 miles east of; top of north rail at road crossing	1,343.3
Harpersville station, 2½ miles west of; top of north rail at road crossing ..	1,225.2
Harpersville station, 0.9 mile west of; top of south rail at road crossing ..	1,097.7
Harpersville station, 1,250 feet west of; coping stone of abutment at southwest corner of iron trestle bridge No. 97; bronze tablet marked "1051 A"	1,048.367
Harpersville station, top of north rail at	1,053.0
Nineveh station, top of north rail at	1,033.0
Afton station, 2½ miles west of; top of north rail at road crossing	983.5

	Feet.
Afton station, top of north rail at	981.3
Afton station, 1,050 feet east of; coping stone of abutment at northeast corner of iron girder bridge No. 90 $\frac{1}{2}$, crossing over highway; bronze tablet marked "973 A"	972.123
Afton, 0.85 mile east of; top of north rail at road crossing	993.9
Bainbridge, 2 miles west of; foundation stone at northeast corner of small cattle pass opening; bronze tablet marked "978 A"	977.026
Bainbridge station, 0.6 mile west of; top of north rail at road crossing	986.7
Bainbridge station, top of north rail at	1,005.5
Bainbridge, 1 mile east of; top of north rail at road crossing	991.8
Bainbridge, 1 $\frac{1}{4}$ miles east of; top of north rail at road crossing	1,007.0
Bainbridge, 2.2 miles east of; top of north rail at road crossing	1,006.6
Bainbridge, 2 $\frac{1}{4}$ miles east of; coping stone of bridge abutment at southeast corner of bridge No. 84; bronze tablet marked "989 A"	989.036
Bainbridge, 3 $\frac{1}{4}$ miles east of; top of north rail at road crossing	993.4
Sidney, Delaware and Hudson station; $\frac{1}{4}$ mile west of; top of rail at crossing of Delaware and Hudson and New York, Ontario and Western railroads	990.3
Sidney, Delaware and Hudson station; at top of south rail at	992.5
Sidney, 1 mile east of; top of south rail at center of bridge No. 82, across Susquehanna River	1,002.2
Unadilla, Delaware and Hudson station at; $\frac{1}{4}$ mile west of; top of south rail at road crossing	1,016.4
Unadilla, Delaware and Hudson station at; $\frac{1}{4}$ mile west of; top of north rail at road crossing	1,016.3
Unadilla, Delaware and Hudson station at; top of south rail	1,024.4
Unadilla, Union school building at; foundation wall at left of main entrance to; aluminum tablet marked "1024 A"	1,022.700
Wells Bridge, 2 $\frac{1}{4}$ miles west of; top of south rail at road crossing	1,036.2
Wells Bridge, 0.8 mile west of; top of south rail at road crossing	1,047.6
Wells Bridge, 0.3 mile west of; top of south rail at road crossing	1,053.3
Wells Bridge, Delaware and Hudson station at; about 300 feet west of; coping stone of abutment at northeast corner of highway bridge across Susquehanna River; bronze tablet marked "1047 A"	1,045.045
Wells Bridge, Delaware and Hudson station at; top of south rail	1,048.9
Otego, 0.9 mile west of; top of south rail, bridge No. 69	1,051.5
Otego, Delaware and Hudson station; top of rail at	1,063.3
Otego, 1 mile east of; southeast corner of culvert, third step from top; bronze tablet marked "1051 A"	1,049.545
Otego, 1.6 miles east of; top of south rail at road crossing	1,057.9
Otego, 2 miles east of; top of south rail at road crossing	1,061.3
Otego, 2 $\frac{1}{4}$ miles east of; top of north rail at center of bridge No. 64, across Susquehanna River	1,063.09
Oneonta, 4 $\frac{1}{4}$ miles west of; top of north rail at road crossing	1,058.6
Oneonta, 3 $\frac{1}{4}$ miles west of; top of north rail at road crossing	1,065.6
Oneonta, 3 miles west of; top of north rail at road crossing	1,067.8
Oneonta, 1.8 miles west of; top of north rail at road crossing	1,066.4
Oneonta, Delaware and Hudson station, 0.9 mile west of; top of rail at road crossing	1,077.6
Oneonta State Normal School; in face of west pillar at main entrance of; aluminum tablet marked "1232 A"	1,231.325
Oneonta, Delaware and Hudson station; top of north rail at	1,083.3
Oneonta, Delaware and Hudson station; southwest corner of doorsill of door into waiting room and dining hall; door faces track and is east of office window	1,085.885

	Feet.
Colliers, 2½ miles west of; top of north rail at road crossing	1,122.4
Colliers, top of rail at Delaware and Hudson station at	1,118.7
Colliers, 700 feet east of; bridge No. 54, across Susquehanna River; north-east corner of coping stone of east abutment; bronze tablet marked "1119 A"	1,117.921
Cooperstown Junction, 0.6 mile west of; top of north rail at road crossing	1,119.0
Cooperstown Junction, top of north rail at	1,126.7
Maryland, 1.9 miles west of; southeast corner of bridge No. 51, across Schenevus Creek; parapet wall; bronze tablet marked "1170 A"	1,169.287
Maryland, 1½ miles west of; top of north rail at road crossing	1,171.7
Maryland, Delaware and Hudson station; top of north rail at	1,212.8
Schenevus, 1.9 miles west of; top of north rail at road crossing (Chaseville)	1,219.6
Schenevus, 1.6 miles west of; top of north rail at road crossing	1,225.0
Schenevus, Delaware and Hudson station, 0.6 mile west of; top of north rail at road crossing	1,249.8
Schenevus, Delaware and Hudson station; top of south rail at	1,275.7
Schenevus, Delaware and Hudson station, ½ mile east of; coping stone of abutment at southeast corner of bridge across Schenevus Creek; bronze tablet marked "1272 A"	1,270.837
Schenevus, 2 miles east of; top of north rail at road crossing	1,307.2
Worcester, 1.9 miles west of; top of north rail at road crossing	1,318.6
Worcester, Delaware and Hudson station; 80 feet west of west end of; railroad water tank foundation; third course of stone east side of bank; aluminum tablet marked "1311 A"	1,309.620
Worcester, Delaware and Hudson station at; top of north rail	1,305.9
Worcester, ½ mile east of; top of north rail at road crossing	1,333.3
Worcester, 1.1 miles east of; top of north rail at road crossing	1,353.8
East Worcester, 2½ miles west of; top of north rail at road crossing	1,400.6
East Worcester, ½ mile west of; center pier of railroad bridge or large culvert; capstone at north end; aluminum tablet marked "1406 A"	1,404.676
East Worcester, Delaware and Hudson station at; top of north rail	1,434.0
East Worcester, 0.8 mile east of; top of north rail at road crossing	1,446.9
East Worcester, 2.3 miles east of; top of north rail at summit of grade ..	1,503.6
Richmondville, 2.2 miles west of; top of north rail at road crossing (Carrollville flag station)	1,378.6
Richmondville, 1.8 miles west of; top of rail in center of bridge No. 33 over highway	1,351.2
Richmondville, 1 mile west of; top of north rail at road crossing	1,295.4
Richmondville, 0.6 mile west of; Delaware and Hudson Railroad bridge No. 31; coping stone of east abutment wall at northeast corner of bridge; bronze tablet marked "1224 A"	1,222.546
Richmondville, Delaware and Hudson station at; top of south rail	1,185.4
Richmondville, 1½ miles east of; top of north rail on bridge No. 31 over highway	1,079.0
Cobleskill, 1.9 miles west of; top of north rail at road crossing	984.7
Cobleskill, 1½ miles west of; top of north rail at road crossing	979.7
Cobleskill, 1 mile west of; □ chisel mark on south end of culvert at west side of road crossing. (Temporary B. M. set by Clark Brown)	948.722
Cobleskill, 0.6 mile west of; top of north rail of road crossing	935.6
Cobleskill Union School building, stone foundation at northwest corner of; bronze tablet marked "930 A"	929.101
Cobleskill; Delaware and Hudson station, top of north rail at	908.6
Cobleskill, 0.9 mile east of; top of north rail at road crossing	888.8

	Feet.
Barnerville Crossing, □ chisel mark on rock 50 feet north of railroad at (set by Clark Brown).....	903.336
Barnerville Crossing, top of north rail at.....	905.6
Howes Cave, 2½ miles west of; top of north rail under overhead farm crossing	923.0
Howes Cave, 1½ miles west of; top of north rail at road crossing.....	885.9
Howes Cave; Delaware and Hudson station, top of south rail at.....	794.9
Howes Cave, ¼ mile east of; top of north rail at road crossing.....	782.6
Howes Cave, 1.2 miles east of; bridge seat at northwest corner of small bridge or open culvert; bronze tablet marked "731 A".....	730.238
Central Bridge, ¼ mile west of; top of north rail at road crossing	641.2
Central Bridge; Delaware and Hudson station, top of north rail opposite.	620.6
Schoharie Junction; Delaware and Hudson station, top of north rail opposite	598.3
Schoharie Junction, 1.2 miles east of; top of north rail at road crossing ..	636.4
Schoharie Junction, 1.3 miles east of; top of north rail at road crossing ..	642.4
Esperance, 0.9 mile west of; top of north rail at road crossing	725.0
Esperance; Delaware and Hudson station, 1,250 feet west of; coping stone at north end of stone culvert under Delaware and Hudson Railroad; bronze tablet marked "753 A".....	751.968
Esperance; Delaware and Hudson station, top of north rail at.....	767.5
Esperance, 1 mile east of; top of north rail at road crossing.....	811.7
Delanson, Delaware and Hudson station, 1.9 miles west of; top of rail at road crossing	836.9
Delanson; Delaware and Hudson station, top of south rail at	812.0
Delanson, 0.6 mile east of; top of rail at road crossing	803.8
Delanson, 1½ miles east of; top of north rail at private road crossing	796.9
Duanesburg, Delaware and Hudson station, 1,000 feet west of; north end of east abutment; bronze tablet marked "681 A"	680.367
Duanesburg; Delaware and Hudson station, top of south rail opposite ...	676.1
Duanesburg, 0.6 mile east of; top of south rail at road crossing.....	660.3
Duanesburg, 1½ miles east of; top of south rail at road crossing	588.2
Kelleys, 2 miles west of; top of south rail at road crossing	556.9
Kelleys station, base of rail at.....	490
Kelleys, 1 mile east of; top of rail at private road crossing	450.4
Kelleys, 1.6 miles east of; top of rail at road crossing.....	419.0
Kelleys, 1½ miles east of; coping stone at east abutment of cattle and wagon pass, 750 feet east of highway; bronze tablet marked "410 A" ..	408.566
South Schenectady, ¼ mile southwest of; top of rail at road crossing	352.5
South Schenectady, top of rail at road crossing 0.2 mile southwest of station	349.3
South Schenectady, top of rail at road crossing at West Shore and Delaware and Hudson railroads	348.7
Schenectady, 2½ miles southwest of; top of north rail at road crossing ...	320.0
Schenectady; Delaware and Hudson station, ¼ mile south of; top of rail under center of bridge, New York Central crossing over Delaware and Hudson Railroad	225.8
Schenectady, New York Central and Hudson River Railroad bridge over Erie Canal; northeast corner of coping stone of abutment wall; bronze tablet marked "242 A".....	240.768

ERIE CANAL, SCHENECTADY TO COHOES.

Schenectady, 4 miles east of; Rexford feeder bridge, Erie Canal; on coping 1½ feet from south corner of west abutment	216.825
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	Feet.
Rexford, $3\frac{1}{2}$ miles east of; coping stone on south corner of east wall of west Lock No. 20.....	207.89
Rexford, $3\frac{1}{2}$ miles east of; top of screw bolt fastening down collar of southwest gate of west Lock No. 20	207.98
Rexford, $6\frac{1}{2}$ miles east of; top of projection of stone on second course of masonry at east corner of south abutment of second canal bridge below Lock No. 19.....	190.46
Cohoes, $3\frac{1}{2}$ miles west of; lower Mohawk Aqueduct, east end of; southwest corner of parapet wall marked \oplus with chisel....	194.19
Cohoes, on top of wall west side of mill race between locks 15 and 16, 6 inches from northeast corner of small brick building between mill race and towpath, marked $+$ with chisel.....	159.01
Cohoes, Lock No. 15; cross cut on second foot iron (clamp) on east wall, south end of west lock; United States Engineer Corps bench mark....	159.501
Cohoes, Lock No. 15; top of point of coping, southwest corner of east wall of west lock	159.42

CHAUTAUQUA COUNTY.

WESTFIELD, DUNKIRK, CHERRY CREEK, AND SILVER CREEK QUADRANGLES.

The elevations published in the following lists are based on the United States Engineer Corps bench mark, top of water table of Nelson Block, the elevation of which is accepted as 588.235 feet. This is derived from the adjusted precise levels of this Survey as brought from the gristmill bench mark at Albany. It differs from the elevations of the United States Engineer Corps, as reduced to the same datum and brought via Oswego and the Great Lakes, by 0.43 foot, the elevation of the same bench mark as derived from the adjusted levels of the United States Engineer Corps being 587.805 feet above mean sea level.

The leveling was done under the direction of Mr. Frank Sutton, topographer, by Mr. E. L. Faison, levelman.

All bench marks dependent on this datum are marked with the letter "D" in addition to the figures of elevation, thus referring them to Dunkirk as a datum.

DUNKIRK TO FREDONIA, ALONG DUNKIRK, ALLEGHENY VALLEY AND PITTSBURGH RAILROAD.

	Feet.
Dunkirk; top of water table, extreme northwest corner of Nelson Block, on Center street.....	588.23
Dunkirk; Elk street crossing of Lake Shore Railroad; top of rail	594.0
Dunkirk, $1\frac{1}{2}$ miles southeast of; extreme northwest corner of stone culvert No. 2, Dunkirk, Allegheny Valley and Pittsburgh Railroad, about 200 feet north of crossing.....	641.78
Dunkirk, 2 miles south of; extreme northwest corner of culvert No. 3, Dunkirk, Allegheny Valley and Pittsburgh Railroad.....	663.74
Fredonia; top of rail opposite ticket-office window, Dunkirk, Allegheny Valley and Pittsburgh Railroad.....	767.2

FREDONIA TO WESTFIELD, VIA LAONA, LILLYDALE, CASSADAGA, STOCKTON, AND MAYVILLE.

Fredonia; mark on north abutment, west side, at trestle over Porter street, Dunkirk, Allegheny Valley and Pittsburgh Railroad	766.53
Laona; in top stone north abutment, west side of iron-deck bridge over Canadaway Creek, Dunkirk, Allegheny Valley and Pittsburgh Railroad; copper plate marked "817 D"	817.295

	Feet.
Laona; top point of rock (in place) 25 feet west of center of Dunkirk, Allegheny Valley and Pittsburgh Railroad and 80 feet north of culvert No. 19	926.40
Laona; iron pin in small wooden trestle No. 52, in south end, west side, in top of woodwork 9 feet above water level, Dunkirk, Allegheny Valley and Pittsburgh Railroad	1,168.96
Lillydale, 1½ miles north of; bench mark marked □, southwest corner of abutment, south end Skidmore viaduct.	1,294.97
Lillydale; water surface of Lake Cassadaga, May 4, 1898.	1,305.9
Lillydale, top of rail opposite station at; Dunkirk, Allegheny Valley and Pittsburgh Railroad	1,312.31
Cassadaga; root of maple tree 45 feet east of center of track at Stockton road crossing; bench mark cut on root on west side of tree.	1,314.07
Cassadaga, 1½ miles west of; top of stone in place 12 feet south of center of road; 300 feet east of center of woods; marked □	1,611.33
Stockton; top of stone in place; 30 feet west of corner of hotel at Mayville street, 3 feet above ground; marked □.	1,323.19
Stockton, 1.1 miles southwest of; top of stone in place 20 feet south of center of road, 1½ feet above surface of ground, halfway uphill.	1,451.55
Stockton, 1½ miles southwest of; bench mark cut on root of tree on south side of road, 90 feet east of road crossing at Goodrich's schoolhouse.	1,595.28
Stockton; 500 feet west of Chrisses' Hotel, 4 feet above ground east side of blacksmith shop on Mayville street; copper plate cemented in stone foundation of shop marked "1316 D"	1,316.890
Stockton, 3.3 miles southwest of; top of stone in place 10 feet south of Mayville road and east of Dewittville road; 25 feet above surface of ground; branch road to Dewittville.	1,557.39
Stockton, 4.1 miles southwest of; top of stone in place on summit of Beach Hill at road crossing (southwest corner); 5 feet from center of road; 0.5 foot above surface of ground.	1,650.06
Stockton, 4.4 miles southwest of; top of stone in place 12 feet north of center of road; 1.5 feet above surface of ground; about 250 yards east of frame house north side of road.	1,540.72
Hartfield; top of stone in place at southeast corner of white house at fork of Jamestown, St. Clairville, and Stockton roads	1,331.60
Mayville; top of clear post at junction of Jamestown and Lake Erie Railway north of Mayville highway and west of railroad.	1,326.09
Mayville; in top stone east abutment north end highway bridge over Black Brook; east side of town and west side of cemetery; copper plate marked "1324 D"	1,324.234
Mayville; top of bottom step of front of court-house; marked □	1,461.86
Mayville; about 2 miles north of junction; iron pin northeast corner wooden trestle over small stream running northwest 600 feet south of road crossing at milepost 62	1,338.97
Mayville, 2.2 miles north of; iron pin northeast corner (top of stringer) of trestle No. 46, over stream running northeast	1,308.04
Mayville, 2.9 miles north of; rail at crossing of water tank	1,273.2
Chautauqua Lake; water surface, May 12, 1898.	1,307.9
Prospect, ½ mile west of; southeast corner of wooden trestle over small stream running northwest.	1,249.09
Prospect, foundation of Western New York and Pennsylvania Railway station office at; copper plate in northeast corner marked "1213 D"	1,213.552
Prospect, ½ mile west of; mark □ on stone in place 20 feet south of center of road, 200 feet west of large white house standing 100 feet north of road	1,077.70

	Feet.
Westfield, 2½ miles east of; crossroads; top of large flat stone over chain running northwest.....	847.88
Westfield, 1½ miles east of; crossroads running east and west and north and south; marked X on top of flat stone northwest corner of culvert.	757.57
Westfield; in masonry of foundation of public-school building, northwest corner, 2½ feet above ground; copper plate marked "748 D"	748.27

WESTFIELD TO FREDONIA, VIA BROCKTON.

West Portland; mark X on northeast corner of second stone step of red brick church.....	774.12
Westfield, top of fifth milestone from; 20 feet north of center of road; north and south road crosses	772.56
Portland; top of milestone marked "Buffalo, 52; Westfield, 6;" west end of town, north side of road.....	763.91
Portland; top of round stone on northwest corner of street opposite blacksmith's shop; about 300 feet east of post-office; 1½ feet above ground; sign above stone reads "Buffalo 51 miles".....	760.89
Brockton; rail at crossing of Western New York and Pennsylvania Railway.	744.5
Brockton; top of low masonry wall, southeast corner of yard of Baptist Church; 35 feet north of center of road, marked X.....	737.37
Brockton, 1 mile north of; copper bolt in south side of center pier of double arch (stone) of Lake Shore Railroad over Slippery Rock Creek; ¼ mile east of station, marked "667 D"	667.887
Brockton, 1 mile east of; top of milestone reading "Buffalo, 49; Westfield, 9;" north side of road.....	739.33
Brockton, 2 miles east of; top of milestone reading "Buffalo, 48; Westfield, 10;" north side of road, in hollow.....	735.44
Fredonia, 2 miles west of; southeast corner of step (wooden) of small white schoolhouse, 75 feet north of road and opposite cemetery.....	760.06
Fredonia; top of south stone step to south entrance clothing store in Columbia Hotel.....	727.89

CASSADAGA TO CHERRY CREEK.

Cassadaga; bench mark cut on root of west side of maple tree, 45 feet east of center of Dunkirk, Allegheny Valley and Pittsburgh Railroad track at Stockton highway crossing.....	1,314.07
Cassadaga; bench mark cut on root of large cherry tree, 35 feet southeast of white schoolhouse bearing sign "Charlotte School District, No. 1," at fork of roads; on north side of tree, 20 feet west of center of road.....	1,358.79
Charlotte Center; top of iron bolt in northeast corner of iron bridge over creek running south through town, 300 feet east of post-office.....	1,535.24
Charlotte Center; highest point of sawed-off stump 15 feet north of road, halfway up long hill sloping west.....	1,640.75
Charlotte Center; copper bolt in stone in place 12 feet north of road; 6 inches above surface of ground; opposite farm line 640 feet east of road turning off south, marked "1915 D"	1,915.256
Charlotte Center; nail in east end of step to white schoolhouse, 75 feet north of fork of roads on summit of hill.....	2,097.63
Cherry Creek; corner of water table at southeast corner of brick block on Main street; 2 feet above ground.....	1,305.83
Cherry Creek; copper bolt in north abutment west side of iron bridge over Cherry Creek, running east on Main street, marked "1309 D"	1,309.88
Cherry Creek; top (mark X) of northwest corner of abutment of plate girder over Cherry Creek, on Erie Railroad, about 400 feet south of station	1,293.14

CHERRY CREEK TO LAONA, VIA HAMLET.

	Feet.
Cherry Creek, 3 miles north of; top of milepost 45-24.....	1,294.49
Cherry Creek, 4 miles north of; top of milepost 44-25.....	1,296.16
Pine Valley, 1 mile west of; nail in root of large willow tree, 300 feet south of red bridge of creek running east; 12 feet east of center of road and at bend of road.....	1,299.81
Pine Valley (or South Dayton); iron spike in post 25 feet west of track; opposite track and Valley Hotel; 3 inches above ground.....	1,298.99
Balcom's post-office, top of northeast corner of porch of; 1.5 feet above ground; 50 feet northwest of road crossing north and south and east and west.....	1,318.85
Hamlet; top of stone in place 35 feet north of road; 250 feet east of small deserted house on south side of road; west side of town; 900 feet east of cemetery.....	1,377.65
Hamlet, 1½ miles west of; top of large stone in place 35 feet north of road; 400 feet east of white house on north side of road.....	1,420.48
Arkwright summit; bench mark on root of beech tree 20 feet north of center of road; 5 feet below road surface; 300 feet east of white school-house.....	1,388.19
Arkwright Center, 0.9 mile east of; copper bolt in large stone in place on north side of road; 15 feet north of center of road; 2 feet above ground; opposite frame house on north side of road, marked "1570 D".....	1,570.375
Arkwright Center; top of stump at fork of roads 150 feet south of second fork; 20 feet west of road center; 2.5 feet above surface of ground.....	4,635.13
Arkwright Center, 1 mile west of; top of stone in place 200 feet west of yellow house standing on small rise 100 feet south of road; 20 feet north of center of road and 4 feet above it on bank.....	1,415.85
Arkwright Center, 1½ miles west of; top of stone in place 90 feet west of crossroads, 20 feet north of center of road; near cemetery; 2 miles east of Laona.....	1,282.55

CATTARAUGUS AND ALLEGANY COUNTIES.

SALAMANCA AND OLEAN QUADRANGLES.

The elevations published in the following list were determined in the field season of 1897, and are based on a bronze tablet set in brick school-house No. 4, on Maple street, Salamanca, and marked "D 1390." The elevation of this bench mark was originally accepted as 1,396.130 feet above mean sea level as based on the railway datum accepted for leveling about Olean during the field season of 1896. During the spring of 1898 a line of precise levels was carried from United States Engineer's bench mark in Dunkirk to this bench mark, and as a result its adjusted elevation is now accepted as being 1,390.630 feet above mean sea level.

The elevations for the Salamanca quadrangle are here published as finally accepted by adjustment to this precise-level line. The bench marks set in the field, however, in the season of 1897 were incorrectly marked with figures of elevation, which are 6 feet higher than their elevations as now accepted and here published.

For similar reasons the bench marks set in 1896 in the Olean quadrangle were marked with figures of elevation 8 feet higher than their accepted elevations, the additional 2 feet coming from the readjustment of the railroad levels made in the fall of 1896. The elevations published

in the Appendix to the Eighteenth Annual Report, Part I, following page 277, were corrected by the 2 feet mentioned, but have still to be corrected by the amount now required to reduce them to the precise-level line. Accordingly, the elevation now accepted for the datum tablet in the city building in Olean is 1,450.937 feet above mean sea level, and all elevations published in that report are to have the amount 6.521 feet subtracted from them to reduce them to the mean sea datum now accepted. The leveling done during the season of 1897 in the Salamanca quadrangle was executed under the general direction of Mr. J. H. Jennings, topographer, by Mr. E. L. McNair, levelman. All bench marks left in the course of this work are marked with the letter "S" in addition to figures of elevation, and are thus distinguishable from those left in connection with the Olean leveling, which were marked with no datum letter, and from the precise-level line just run, the bench marks of which are marked with the datum letter "D."

OLEAN VIA ALLEGANY AND VANDALIA TO CARROLLTON.

	Feet.
Olean, public school No. 2 (brick structure) on south side of State street; chiseled square on northwest corner of stone step at entrance.....	1,424.64
Olean City Building, 2.16 miles northwest of; chiseled square on south end of stone culvert, east side, over small stream	1,414.40
St. Bonaventure College, $\frac{1}{4}$ mile west of; chiseled square on boulder at southwest corner of intersection of roads.....	1,423.66
Allegany, iron bridge over Fivemile Creek; chiseled square on foundation abutment.....	1,409.60
Allegany, $2\frac{1}{4}$ miles west of; chiseled square on north end of small stone culvert under highway.....	1,406.76
Vandalia station, iron highway bridge near; chiseled square on stone abutment at southeast corner	1,402.01
Vandalia, 1.1 miles west of; chiseled square on small boulder at north side of plank bridge about 5 feet west of watering trough and 30 feet south of spring	1,431.76
Vandalia, 2.7 miles west of; chiseled square on large flat slab in slanting position on north side of road between telephone poles Nos. 6442 and 6443	1,427.83
Vandalia, 3.5 miles west of; chiseled square on large boulder north side of road about 125 feet west of road south to Limestone and Bradford...	1,402.17

SOUTH VANDALIA SOUTHWARD THROUGH CHIPMUNK OIL FIELDS.

South Vandalia station, $\frac{1}{4}$ mile south of; chiseled square on large flat stone in front yard of white farmhouse west side of road.....	1,404.80
South Vandalia station, 2.7 miles south of; chiseled square on boulder in ditch on west side of road nearly opposite schoolhouse.....	1,446.36
South Vandalia station, 3 miles south of; copper bolt in boulder 2 feet outside fence on west side road 55 feet south of road east and 140 feet north of M. Kelly's white house on west side of road; bolt is marked "1529 Ft. S."	1,523.294
Knapps Creek, top of rail in front of electric railroad station	2,341.3

CARROLLTON VIA LIMESTONE TO NEW YORK AND PENNSYLVANIA STATE LINE.

Carrollton, $\frac{1}{4}$ mile east of; chiseled square on large boulder west side of road about 25 feet from northwest corner of iron bridge over slough....	1,387.18
Carrollton, 2 miles south of; iron highway bridge crossing Allegheny River, chiseled square on bridge abutment about 8 feet from southeast corner.	1,396.38

	Feet.
Allegheny River iron highway bridge, 0.83 mile south of, and 4 miles north of Limestone; copper bolt in large boulder nearly buried in ground on west side of road between it and ditch, pole bars entering pasture fields on each side of road; bolt marked "1410 Ft. S."	1, 404. 868
Limestone, 3 miles north of and 75 feet west of road going up Rice Creek; chiseled square on boulder in field east side of road	1, 399. 51
Limestone, 2 miles north of; chiseled square on large boulder, east side of road about 4 feet from wagon track between telephone poles 6188 and 6189	1, 421. 83
Limestone, 0.6 mile west of chiseled square on small boulder, 4 feet from fence corner, northwest corner of intersection of roads	1, 399. 25
Limestone, 1.7 miles southwest of; nail in root of maple tree east of road between telephone poles 6077 and 6078.	1, 426. 48
Limestone, 2.3 miles southwest of; chiseled square on top of State line monument on west side of road near oil derrick, opposite telephone pole 6050	1, 449. 98
Limestone, 2.8 miles southwest of; nail in small projecting root of large elm tree, 45 feet north of northwest corner of large iron bridge over stream just inside Pennsylvania State line	1, 407. 53
Limestone, 2 miles south of; chiseled square on stone abutment 9 feet from southwest corner of iron bridge over stream just inside Pennsylvania State line	1, 412. 62
Limestone, 2 miles south of, at iron bridge described in last-named bench mark; chiseled square on stone abutment 12 feet from southeast corner of bridge	1, 411. 85

SALAMANCA TO RED HOUSE.

Salamanca, opposite First National Bank; chiseled square on corner of curbstone 1 foot from telephone pole	1, 382. 38
Salamanca, Maple street; brick schoolhouse No. 4; bronze tablet, in water table at west side of front entrance, marked "1396 Ft. S"	1, 390. 630
West Salamanca, near iron highway bridge across Allegheny River; chiseled square on stone horse block on west side of road in front of square white house	1, 375. 32
Salamanca, 2.5 miles west of; chiseled square on highest point of irregularly shaped boulder just opposite small wood-colored house south of road	1, 372. 39
Salamanca, 3.5 miles west of; wire nail in root of elm tree west of road, opposite church on east side of road	1, 365. 54
Red House, 3.5 miles north of; tack in root of maple tree on west side of road, 15 feet south of another maple and 75 feet north of small wooden bridge	1, 362. 33
Red House, 2.6 miles north of; chiseled square on small flat rock beside gatepost in front of small white house on east side of road occupied by Indian family. River bank close to west side of road	1, 352. 07
Red House, large iron highway bridge across Allegheny River, chiseled square on lower step of bridge abutment at northeast corner	1, 342. 05
Red House, Western New York and Pennsylvania Railway, top of rail opposite station	1, 345. 0
Red House, 5.9 miles southeast of, on road to Halls; bolt southwest corner of iron bridge over Red House Creek	1, 560. 0

KILLBUCK TO GREAT VALLEY.

Killbuck, 0.93 mile north of; chiseled square on small flat stone in center of gateway in front of weather-stained house on east side of road at forks of road	1, 396. 76
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	Feet.
Killbuck, 2 miles north of; chiseled square in front of large flat stone doorstep in front of front door of one and one-half story house on north side of road and about 200 feet north of iron bridge over Great Valley Creek	1, 423. 15
Killbuck, 3.15 miles north of; chiseled square on stone abutment at southeast corner of iron bridge across Great Valley Creek	1, 430. 20
Killbuck, 3.9 miles north of; copper bolt in stone abutment at southwest corner of iron bridge across Wrights Creek about $\frac{1}{4}$ mile above its junction with Great Valley Creek; bolt is marked "1456 Ft. S"	1, 451. 078
Great Valley, iron bridge across Great Valley Creek; bridge abutment at northeast corner	1, 463. 64
Great Valley, 1.7 miles north of and 3 miles south of Ellicottville; chiseled square on foundation stone under post 14 feet south of northeast corner of C. B. Potter's barn; a road crosses Buffalo, Rochester and Pittsburgh Railway and creek between barn and house	1, 515. 51

GREAT VALLEY TO HUMPHREY.

Great Valley, 1.3 miles south of; chiseled square on stone horse block north of road in front of yellow house	1, 518. 49
Great Valley, 2.52 miles southeast of; chiseled square on stone abutment northwest corner of iron bridge across Wrights Creek, near a white church	1, 512. 76
Humphrey, 2.7 miles west of; chiseled square on north end of stone masonry around end of sewer-pipe culvert under highway	1, 527. 85
Humphrey, 1.7 miles west of; chiseled square on stone abutment 4 feet from southeast corner of iron bridge across Wrights Creek	1, 548. 13
Humphrey, 1 mile west of; chiseled square on bowlder at southeast corner of small wooden bridge on north and south road about 75 feet south of the road running east and west to Humphrey	1, 575. 84
Humphrey, W. J. Sherman's hotel; copper bolt in stone doorstep in front of porch, west side, marked "1626 Ft. S"	1, 620. 599

YATES, SCHUYLER, STEUBEN, AND CHEMUNG COUNTIES.

WATKINS QUADRANGLE.

The elevations published in the following list are based on a bronze tablet set in the Schuyler County court-house, in Watkins, New York, and marked "D 476." The elevation of this bench mark above mean sea level is derived from the nearest bench mark of the line of precise levels run by this Survey through Horseheads. Based on this the height of the Watkins bench mark is accepted as 476.631 feet above mean sea level.

The leveling was done under the direction of Mr. R. D. Cummin, topographer, by Mr. W. W. Gilbert, levelman.

All bench marks dependent on the Watkins datum are marked with the letter "D," thus referring them to the bench mark at Dunkirk, through the precise-level line.

HORSEHEADS TO WATKINS, ALONG NORTHERN CENTRAL RAILWAY.

	Feet.
Horseheads; Lehigh Valley Railroad; main track top of rail opposite southeast line of Horseheads station	890. 0
Horseheads; northwest corner of stone doorsill at men's waiting room of Northern Central station	899. 34

	Feet.
Horseheads; top of rail of Northern Central Railway opposite north line of Horseheads station.....	898.9
Pine Valley; top of rail Northern Central Railway; opposite south line of Pine Valley station.....	890.2
Pine Valley, $\frac{1}{4}$ mile north of; southeast corner of top stone of south abutment of Northern Central Railway bridge at mill pond.....	872.93
Millport; bronze tablet in face of abutment at southwest corner of highway bridge over Catharine Creek at Millport House; marked "709 D" ..	709.855
Millport, station at; chiseled mark southeast corner of north abutment of Northern Central Railway bridge over highway.....	748.38
Millport, station at; top of rail of Northern Central Railway at north line.	749.7
Millport, 1 mile north of; top of rail Northern Central Railway track at milepost 55	720.5
Millport, 2 miles north of; top of rail Northern Central Railway track at milepost 54	668.3
Millport, 2 $\frac{1}{2}$ miles north of; west side of Northern Central Railway track; north post of support for extra rail, nail in	639.14
Millport, 3 miles north of; top of rail Northern Central Railway track; 30 feet south of milepost 53.....	618.0
Millport, 3 miles north of; nail in south post of extra-rail support, Northern Central Railway, 370 feet south of milepost 53.....	611.90
Millport, 3 $\frac{1}{4}$ miles north of; top of rail Northern Central Railway track at highway crossing.....	591.6
Montour Falls, 2 $\frac{1}{2}$ miles south of; nail in north post of support for extra rail, 150 feet south of milepost 52, Northern Central Railway.....	566.95
Montour Falls, 1 $\frac{1}{2}$ miles south of; nail in south post of support for extra rail at 51 $\frac{1}{2}$ mile mark, Northern Central Railway	535.22
Montour Falls, 1 $\frac{1}{2}$ miles south of; chisel mark on northeast corner of top stone of south abutment of Northern Central Railway bridge over highway	509.00
Montour Falls, $\frac{1}{4}$ mile south of; nail in north post of support for extra rail at 51 $\frac{1}{2}$ mile mark, Northern Central Railway.....	481.37
Montour Falls station, 800 feet south of; top of rail of Northern Central Railway at highway crossing.....	455.6
Montour Falls station; top of rail opposite north line of	457.0
Montour Falls station, 200 feet north of; top of rail Northern Central Railway at highway crossing	458.0
Montour Falls, southwest corner of Main street and Railroad lane; northeast corner of stone foundation to railing in front of Montour House...	461.45
Montour Falls, old Schuyler County court-house; chisel mark on foundation (base) of east pillar, front of court-house.....	466.46
Montour Falls station, $\frac{1}{4}$ mile north of; top rail on Northern Central Railway bridge over stream.....	452.5
Montour Falls station, $\frac{1}{4}$ mile north of; top of rail of Northern Central Railway at highway crossing	451.2
Montour Falls; water surface in head of old canal.....	443.0
Montour Falls, $\frac{1}{4}$ mile north of; top of rail Northern Central Railway bridge over small stream.....	450.0
Milepost 49; top of rail of Northern Central Railway at.....	449.2
Watkins station, 1 mile south of; nail in top of post No. 6, marking bridge post on east side of Northern Central Railway, 60 feet north of milepost 48	449.14
Watkins station, 1 mile south of; top of rail on Northern Central Railway bridge over small stream, 100 feet north of milepost 48.....	449.4
Watkins station, $\frac{1}{4}$ mile south of; chisel mark on southeast corner of north abutment Northern Central Railway bridge over Glen Creek.....	460.70

	Feet.
Watkins, Schuylers County court-house; bronze tablet set in foundation at front; northwest corner, second course of stone from top, 3 feet south of corner; marked "476 D"	476. 631
Watkins; top of fire plug on north side of Fourth street at west line of Magee street.....	453. 21

WATKINS TO BURDETT STATION, ALONG HIGHWAY.

Watkins; water surface in old canal at entrance to Seneca Lake, May, 1898	44. 3
Watkins, 1 mile east of; chisel mark on top stone of north end of east abutment of Fourth street bridge over Catharine Creek.....	446. 02
Watkins, 1½ miles northeast of; on Burdett road about ¼ mile north of Fourth street; chisel mark west end of north abutment of highway bridge over stream.....	475. 12
Watkins, 1½ miles northeast of; on Burdett road, ¼ mile north of Fourth street; chisel mark on top stone at east end of small culvert under road	538. 93
Watkins, 2 miles northeast of; chisel mark on stone east side of Burdett road, 8 feet from road; 150 feet south of road to the east	676. 30
Watkins, 2½ miles northeast of; chisel mark on stone at the east end of a small culvert under the Burdett road, 1½ miles north of Fourth street.	827. 66
Burdett, ¼ mile south of; cut on northwest corner of stone horse block in front of house of T. O. Stephen on east side of road.....	1, 002. 25
Burdett; chisel mark on large stone at corner in front of Elliot's store; 15 feet from store door	978. 21
Burdett; nail in top of small marking post at southwest corner of highway and Lehigh Valley Railroad.....	1, 003. 91
Burdett station, top of rail at Lehigh Valley Railroad, south line of.....	1, 002. 5

BURDETT TO ODESSA, ALONG LEHIGH VALLEY RAILROAD.

Burdett station, 600 feet south of; copper bolt set in north end of coping west end of culvert under Lehigh Valley Railroad; marked "1002 D".	1, 002. 665
Burdett station, Lehigh Valley bench mark 309; iron bolt north end of coping west end of culvert under Lehigh Valley Railroad; marked "1002 D".....	1, 002. 82
Burdett station, 1 mile south of; upper surface of tie at milepost 309	1, 015. 7
Burdett station, 1½ miles south of; Lehigh Valley bench mark 307; iron bolt set in top course of west end of south abutment of Lehigh Valley Railroad bridge over intersection of highways; marked "1018 D".....	1, 019. 03
Burdett station, 1¾ miles south of; top of rail at highway crossing.....	1, 031. 8
Burdett station, 2¾ miles south of; top of rail at highway crossing.....	1, 041. 3
Burdett station, 3 miles south of; 150 feet north of milepost 307, Lehigh Valley bench mark 306; iron bolt set in top stone of east end of small culvert under Lehigh Valley Railroad; marked "1040 D".....	1, 040. 96
Burdett station, 4¼ miles south of; Lehigh Valley bench mark 305; iron pin set in face of west abutment of highway bridge over Lehigh Valley Railroad, near north end of abutment, ¼ mile south of milepost 306; marked "1059 D".....	1, 059. 66
Odessa, 2½ miles north of; top of rail at highway crossing.....	1, 666. 3
Odessa, 2 miles north of; Lehigh Valley bench mark 304; iron bolt set in top stone east end of culvert under Lehigh Valley Railroad, 450 feet south of milepost 305; marked "1070 D"	1, 070. 24
Odessa, 1½ miles north of; Lehigh Valley bench mark 393; iron pin set in top stone east end of culvert under Lehigh Valley Railroad, 250 feet north of milepost 304; marked "1077 D".....	1, 077. 71
Odessa, ½ mile north of; rail on Lehigh Valley bridge over highway.....	1, 092. 8

	Feet.
Odessa, $\frac{1}{2}$ mile north of; Lehigh Valley bench mark 302; iron bolt set in coping west end of south abutment of Lehigh Valley bridge over highway	1,089.85
Odessa; top of east rail west track at line at south end of station	1,093.0
Odessa, 550 feet south of station; bronze plate set in face of coping near north end on west end of culvert under Lehigh Valley Railroad; marked "1053 D"	1,053.851

ODESSA TO MILLPORT, VIA CATHARINE.

Odessa; chisel mark on boulder at north line of carriage shop	1,049.94
Odessa, 1 mile south of; chisel mark on abutment at southeast corner of highway bridge over Spalding's Creek	1,040.83
Catharine; chisel mark on northeast corner of stone horse block in front of the house of Walter Lyon; house at southeast corner of four corners ..	1,185.92
Catharine, $\frac{1}{2}$ mile south of; chisel mark on large boulder west side of road and near road; 200 feet south of house of M. J. Hitchcock; house on east side of road	1,375.18
Catharine, $1\frac{1}{2}$ miles south of; at forks of road; chisel mark on boulder used as a horse block in front of house of Lyman Kendall on east side of road	1,512.06
Millport, $2\frac{1}{2}$ miles northeast of; chisel mark on boulder in front of house owned by Harvey Turner; house on north side of road in fork of main road and a road going north; schoolhouse No. 3, Veteran Township, at fork in roads	1,471.35
Millport, 1 mile east of; chisel mark on boulder at southwest corner of road east from Millport and road from Catharine	1,104.24
Millport, $\frac{1}{2}$ mile east of; on top of large stone in grass in center of road at first road to the north; east of Millport	1,059.6
Millport, $\frac{1}{2}$ mile east of; on southwest corner of stone horse block in front of house of Morgan Hill, on north side of road	895.82

WATKINS TO TOWNSEND, VIA WATKINS STATION OF THE FALL BROOK RAILWAY.

Watkins; curb at northeast corner of Fourth and Franklin streets	458.4
Watkins; curb in front of post-office at	468.7
Watkins; chiseled cross on northwest corner of south abutment of bridge over stream; $\frac{1}{2}$ mile north of post-office, Steuben street	624.10
Watkins station, $\frac{1}{2}$ mile east of; chisel mark on large stone south side of road at west line of cemetery	938.58
Watkins station (Fall Brook Railway); top of rail opposite south line of station	1,002.6
Watkins Glen station; top of rail at south line of	1,008.3
Watkins Glen station; Fall Brook Railway bridge over Glen Creek; chisel mark on southeast corner of north abutment	1,008.65
Watkins station, 2 miles south of; $\frac{1}{2}$ mile west of Fall Brook Railway, on Townsend road; nail in root of oak tree, 2 feet from trunk, on northeast side of tree; tree in fence line 10 feet south of southeast corner of road ..	1,055.51
Fall Brook Railway, $1\frac{1}{2}$ miles west of; $\frac{1}{2}$ mile west of Glen schoolhouse; south side of road; 100 feet east of house of George Hering; chisel mark on top of large boulder; boulder 5 feet from road	1,121.36
Townsend, $1\frac{1}{2}$ miles east of; nail in root of lone apple tree north side of road 10 feet from road and 475 feet east of house of Charles Pike; nail on northwest side of tree	1,312.94
Townsend, $\frac{1}{2}$ mile northeast of; nail in top of pile at southeast corner of wooden bridge over stream	1,228.38
Townsend; northwest corner of road from Watkins and east and west road; chisel mark on small boulder in front of house of Rebecca Huey ..	1,312.00

TOWNSEND TO MILLPORT, VIA BEAVER DAMS, KENDALLS, CATLIN HILL, AND JOHNSON HOLLOW.

	Feet.
Townsend; on large stone at southeast corner of main road east and west and the Beaver Dams road	1,280.1
Townsend, $\frac{1}{2}$ mile south of; chisel mark on large bowlder west side of Beaver Dams road, 7 feet from road; 60 feet north of house of L. C. Barker; house on east side of road	1,422.08
Townsend, 2 miles south of; chisel mark on northeast corner of top step of a flight of stone steps leading from the house of W. T. Beebe to the road; house on the east side of the Beaver Dams road	1,341.79
Beaver Dams, 1 mile north of; chisel mark on granite bowlder at southeast corner of Townsend road and road to Watkins	1,319.72
Beaver Dams; northwest corner of Monterey road at store of E. V. Moore; chisel mark on large bowlder	1,264.10
Beaver Dams, $\frac{1}{2}$ mile south of; top of rail Fall Brook Railway crossing ..	1,234.8
Beaver Dams, $\frac{1}{2}$ mile south of; chisel mark on abutment at northwest corner of iron highway bridge over small stream	1,233.55
Kendalls; corner of Beaver Dams road and road to Kendalls station; chisel mark on bowlder at northwest course	1,198.41
Beaver Dams, house of David Beardsley; aluminum plate set in foundation of house, center of front, second course from top; marked "1262 D" ..	1,262.407
Kendalls, 1 mile northeast of; chisel mark, abutment at north corner of iron highway bridge over East Creek	1,260.16
Kendalls, 2 miles east of; nail in root of small maple tree on west side of tree; 200 feet east of road to north, 15 feet from road, on south side of road	1,434.69
Catlin Hill, on Elmira road, 30 feet north of corner of road leading down into Johnson Hollow; nail in root northwest side of cherry tree 1.3 feet from the trunk; tree in fence line on east side of Elmira road	1,713.03
Millport, 4 miles west of; at head of Johnson Hollow; chisel mark on large bowlder at west side of road from Catlin Hill to the north, on line of fence north side of road to Lower Pine Valley	1,083.32
Millport, $2\frac{1}{2}$ miles west of; schoolhouse No. 9, Catlin Township; chisel mark on footing course of foundation at southwest corner of building ..	1,049.98
Millport, $\frac{1}{2}$ mile west of; chisel mark on bowlder south side of road, 7 feet from road, 180 feet west of house of L. W. Morse; house on north side of road	934.51

WATKINS STATION, FALL BROOK RAILWAY, TO READING CENTER, ALONG HIGHWAY.

Watkins station, Fall Brook Railway, 180 feet west of; chisel mark on bowlder 8 feet south of road	1,012.62
Watkins station, Fall Brook Railway, $\frac{1}{2}$ mile west of; at northeast corner of road to Reading Center; top of stone	1,043.1
Watkins station, $\frac{1}{2}$ mile north of; on stone at southwest corner of road from the station and the road to Tyrone	1,005.5
Watkins station, $\frac{1}{2}$ mile north of; in fence line east side of road at Reading Center, 50 feet north of Tyrone road; nail in stump	978.56
Reading Center, 2 miles south of; chisel mark on northeast corner of south abutment of highway bridge over stream	1,002.07
Reading Center, 1 mile south of; nail in root of oak tree on north side of tree on east side of road opposite road to the west	1,130.57
Reading Center, Baptist Church at; bronze plate set in foundation south side; fourth course from top, $4\frac{1}{2}$ feet from southeast corner of church; marked "1253 D"	1,253.155

BURDETT ALONG LEHIGH VALLEY RAILROAD TOWARD HECTOR TO A POINT 4 MILES NORTH OF BURDETT.

	Feet.
Burdett station, 1 mile north of; on surface of tie at milepost 311.....	988.6
Burdett station, 1½ miles north of; on spike driven in cleft in rock in rock out east side of track; 8 feet from outer rail, 2 feet above rail; 3,000 feet (100 rail lengths) north of milepost 311.....	982.63
Burdett station, 2 miles north of; on surface of tie at milepost 312.....	979.6
Burdett station, 2½ miles north of; top of rail at highway crossing.....	969.7
Burdett station, 2¾ miles north of; Lehigh Valley bench mark 312; iron bolt set in pier of water tank, north pier east side of tank; tank west of track; marked "963 D".....	963.05
Burdett station, 3 miles north of; on surface of tie at milepost 313.....	957.2
Burdett station, 3¼ miles north of; top of rail at highway crossing.....	956.0
Burdett station, 4 miles north of; copper bolt set in west end of south abutment of Lehigh Valley Railroad bridge over small stream, 100 feet north of milepost 314; back of house of B. J. Erway on Lake road; marked "939 D".....	939.699
Burdett station, 4 miles north of; Lehigh Valley bench mark 313; iron bolt in west end of south abutment of bridge over small stream; marked "939 D".....	939.82

TOMPKINS, CORTLAND, SCHUYLER, TIOGA, AND CHEMUNG COUNTIES.

WAVERLY AND DRYDEN QUADRANGLES.

The elevations published in the following list are based on an aluminum tablet set in the City Hall building at Waverly, marked "840 Albany 1898." The elevation of this bench mark above mean sea level is dependent upon the Gristmill bench mark at Albany, from which it is derived through the line of precise levels run by this Survey through Waverly. Based on this the height of the Waverly bench mark is accepted as 838.582 feet above mean sea level.

The leveling was done under the direction of Mr. R. D. Cummin, topographer, by Mr. W. W. Gilbert, levelman.

All bench marks dependent on the Waverly datum are marked with the letter "A", referring them to the Gristmill bench mark at Albany.

WAVERLY TO LOWMANVILLE, VIA CHEMUNG.

	Feet.
Waverly, 1 mile west of; iron railing at northwest corner of highway bridge over Chemung River; highest point of post nearest bridge.....	785.65
Waverly, 2 miles west of, in front of house of James Wilson, at road to north; southeast corner of stone horse block.....	786.29
Chemung, 1½ miles east of; Erie Railroad crossing; top of rail.....	809.7
Chemung, 1½ miles east of, at Erie Railroad crossing; top of easternmost of two stone hitching posts in front of house, north side of road.....	805.73
Chemung; bridge over Chemung River, floor of.....	803
Chemung, in front of first house west side of road north of four corners; southwest corner of iron safe used as horse block.....	850.79
Chemung, 2 miles west of and 100 feet west of bridge over old canal; nail in root east side of sycamore tree 5 feet south of road.....	801.31
Chemung, 3 miles west of, ¼ mile east of schoolhouse on south side of road; nail in root southeast side of elm tree on north side of road.....	807.96
Lowmanville, 2½ miles east of; Delaware, Lackawanna and Western Railroad bridge over Chemung River; bottom of floor beams.....	814.4

	Feet.
Lowmanville, 2 miles east of; west of road to north; nail in root, west side of westernmost of two small maples on south side of road	823.69
Lowmanville, Delaware, Lackawanna and Western Railroad station; top of rail at highway crossing.....	826.5
Wellsburg, bridge over Chemung River; rivet head southwest shoe of southwest pier.....	823.68

LOWMANVILLE, VIA NORTH CHEMUNG, TO BRESPORT.

Lowmanville, 1 mile north of; nail in root west side of elm tree in fence, east side of road near creek, $\frac{1}{4}$ mile north of turn in road to north.....	855.25
Lowmanville, $2\frac{1}{4}$ miles north of; 300 feet north of reverse curve in road; nail in northeast root of northernmost of two large pines on west side of road	908.10
North Chemung, $2\frac{1}{4}$ miles southwest of; nail in root west side of hickory tree in field, 8 feet south of road fence and 200 feet northeast of road to southeast at watering trough.....	922.35
North Chemung, 1 mile south of; nail in southwest root of evergreen tree in front of house at northeast corner of road north	988.54
North Chemung, north of cemetery; nail in root of maple tree west side of road, fourth from north end of row of 13 large maples in front of house on east side of road.....	1,015.18
North Chemung, $1\frac{1}{4}$ miles north of; nail in west root of large butternut tree on east side of road in picnic grove at fork of road.....	1,075.86
North Chemung, $2\frac{1}{4}$ miles north of, at road to east; nail in root 1 foot from trunk on south side of chokecherry tree in fence, west side of road.	1,123.82
Bresport, 2 miles south of and 700 feet north of road to east; nail in west root of large prominent maple tree on east side of road.....	1,158.91
Bresport, $\frac{1}{4}$ mile south of county buildings; nail in root west side of elm tree at north side of entrance to cemetery on east side of road.....	1,153.67
Bresport, county buildings; on west face of foundation of brick structure, 3 feet above ground and 25 feet south of the northwest corner, between second and third cellar windows therefrom; aluminum tablet, marked "A 1160".....	1,159.667

FROM BRESPORT TO SWARTWOOD VIA ERIN AND LEHIGH VALLEY RAILROAD.

Bresport, $\frac{1}{4}$ mile east of; top of rail Lehigh Valley Railroad crossing....	1,119.5
Erin, 1 mile west of, at west line of Scotchtown Cemetery; nail in root south side of maple tree on north side of road.....	1,188.54
Erin station, Lehigh Valley Railroad; chisel mark on top of foundation, 6 feet south of northeast corner.....	1,246.58
Erin station, east line of; top of rail opposite.....	1,246
Erin, $\frac{1}{4}$ mile north of, on Lehigh Valley Railroad; top of rail at highway crossing	1,253.6
Erin, $\frac{3}{4}$ mile north of, on Lehigh Valley Railroad, at highway crossing, top of rail.....	1,265.9
Erin, $1\frac{1}{4}$ miles north of, on Lehigh Valley Railroad; top of rail at highway crossing	1,318.5
Erin, $1\frac{1}{4}$ miles north of, on Lehigh Valley Railroad, at highway crossing; 50 feet north of highway and 40 feet east of track; nail in root northeast side of small elm tree.....	1,316.15
Erin, $1\frac{1}{4}$ miles north of, on Lehigh Valley Railroad; top of rail at highway crossing	1,336.4
Erin, 2 miles north of, on Lehigh Valley Railroad, in cut; $\frac{1}{4}$ mile south of sixteenth milepost from Elmira; chisel mark on boulder 3 feet west of track	1,374.30

	Feet.
Park station, $\frac{1}{4}$ mile southwest of, on Lehigh Valley Railroad; top of rail at highway crossing.....	1,421.3
Park station, water tank; iron pin in foundation, south side of tank (Lehigh Valley Railroad bench mark).....	1,499.35
Park station, top of rail at highway crossing.....	1,505.5
Park station, 1 mile east of, on Lehigh Valley Railroad; highway crossing at trestle; top of rail.....	1,403.7
Park station, 1 mile east of, on Lehigh Valley Railroad; iron pin in top at center of east abutment of trestle (Lehigh Valley Railroad bench mark 18).....	1,391.00
Park station, $1\frac{1}{4}$ miles east of, on Lehigh Valley Railroad; iron pin in top, south end of east abutment of trestle (Lehigh Valley Railroad bench mark 19).....	1,303.61
Swartwood; iron pin in foundation, east corner of water tank (Lehigh Valley Railroad bench mark 21).....	1,052.68
Swartwood; top of rail opposite north line of station.....	1,052.4
Swartwood, residence of Benjamin Barnes; center of foundation, north wing, front of house; permanent bench mark; aluminum tablet, marked "A 1054".....	1,053.559

SWARTWOOD TO VAN ETTEN.

Swartwood, 2 miles southeast of; on Lehigh Valley Railroad; highway bridge over Cayuta Creek; chisel mark on rivet head on shoe at east corner of bridge.....	1,005.10
Van Etten, Warner street crossing of Lehigh Valley Railroad, E. and C. Branch; top of rail.....	1,004.7
Van Etten, southeast corner of Waverly and Warner streets; water table at northwest corner of new brick building.....	1,017.91

VAN ETTEN TO WAVERLY, VIA RENIFF AND LOCKWOOD.

Van Etten, $\frac{1}{4}$ mile southwest of; top of rail at crossing of Lehigh Valley Railroad, Elmira, Cortland and Northern Division.....	996.2
Van Etten Junction, crossing Elmira, Cortland and Northern Division of Lehigh Valley Railroad; top of rail.....	991.2
Van Etten Junction, $\frac{1}{4}$ mile south of; iron highway bridge over Cayuta Creek; iron pin (Lehigh Valley Railroad bench mark) in southeast abutment of bridge, 200 feet west of Lehigh Valley Railroad.....	969.40
Van Etten Junction, $\frac{1}{4}$ mile south of; Lehigh Valley Railroad crossing; top of rail.....	975.3
Van Etten, $2\frac{1}{4}$ miles south of; Lehigh Valley Railroad water tank; top of rail.....	963.6
Van Etten, 3 miles south of; nail in top of stump west edge of road near stream, 1,000 feet north of old barn and opposite group of old barns on west side of stream.....	948.79
Van Etten, 4 miles south of; 50 feet north of stream crossing road and running west; nail in root south side of apple tree in field, against road fence.....	954.27
Reniff, $\frac{1}{4}$ mile north of; 50 feet south of house, on west side of road; nail in root on northeast side of apple tree, 8 feet west of road.....	929.28
Reniff, southeast corner of iron highway bridge over Cayuta Creek; chisel mark on shoe.....	916.07
Reniff, $\frac{1}{4}$ mile south of; northeast corner of iron highway bridge over stream at road east; chisel mark on shoe of bridge.....	915.83
Lockwood, 125 feet north of road to station, in front of house on west side of road; chisel mark on southeast corner of stone horse block.....	898.37

	Feet.
Lockwood, 1½ miles south of; east side of road opposite Lehigh Valley Railroad bridge; nail in root west side of pine tree.....	891. 63
Lockwood, 3 miles south of; nail in root east side of elm tree, in fence, west side of road, 50 feet south of road to west.....	868. 46
Waverly, 2 miles north of; iron highway bridge over Cayuta Creek; chisel mark on southeast abutment	837. 27
Waverly, ¼ mile northeast of; west side of road at northwest corner of road west, in front of large brick house; northeast corner of upper stone of horse block	863. 22
Waverly, corner of Chemung and Ithaca streets; top of hydrant	834. 14
Waverly, northwest corner of Chemung and Waverly streets; top of hydrant.....	851. 98
Waverly, high-water mark in lower reservoir.....	1,040. 8
Waverly, ¼ mile west of; Delaware, Lackawanna and Western Railroad bridge over Chemung River; bottom of lower chord.....	790. 5

VAN ET TEN TO WILSEYVILLE, VIA SPENCER.

Van Etten, 1½ miles east of; nail in root east side of hickory tree in center of roads at fork to southwest	1,025. 2
Spencer, Lehigh Valley Railroad crossing; top of rail	998. 9
Spencer, southwest corner of Main and Tioga streets; in water table on north side of Fisher Block, 1 foot east of northwest corner; bronze tablet, marked "A 995"	904. 461
East Spencer, Lehigh Valley Railroad station; top of rail.....	985. 3
East Spencer, 20 feet from southwest corner of Lehigh Valley Railroad station and 12 feet north of track; nail in top of small stump.....	985. 46
West Candor, Lehigh Valley Railroad station; top of rail.....	954. 9
North Candor, Lehigh Valley Railroad station; top of rail.....	947. 7
Wilseyville, 2 miles south of; nail in root of maple tree west side of road against fence, and opposite road to Prospect Valley.....	932. 08

WILSEYVILLE TO BESEMERS.

Wilseyville, 1½ miles north of; 50 feet north of Miss Emily Ross's house; nail in root, southeast side of maple tree, west side of road.....	1,010. 37
Wilseyville, 2½ miles north of; Delaware, Lackawanna and Western Railroad bridge over highway; south abutment, under west rail and 2½ feet above ground; aluminum tablet, marked "957"	957. 214
White Church, ½ mile south of; opposite James Stephens's house; nail in southwest root of maple tree east side of road at south line of house....	1,084. 18
Brookton, ¼ mile south of at northwest corner of road west to Caroline station; nail in root west side of maple tree.....	1,030. 78
Brookton, Lehigh Valley Railroad station; 15 feet south of highway crossing and between main and side tracks; nail in top of marking post.....	960. 99

BESEMERS TO CAROLINE, VIA SLATERVILLE SPRINGS.

Besemers, 1½ miles east of, at John Genung's house; nail in root of maple tree, 1 foot from trunk, on north side of road, outside of fence, and 5 feet east of walk leading to front door of house	1,133. 73
Slaterville Springs, 1 mile west of, at road to north; chisel mark on bowlder northeast corner of roads	1,052. 05
Slaterville Springs, ¼ mile west of, at road south; northwest corner of stone slab	1,056. 2
Slaterville Springs, ½ mile west of; floor of small bridge over stream.....	1,089. 6
Slaterville Springs, Methodist church; chisel mark on top of southwest corner foundation.....	1,116. 71

	Feet.
Slaterville Springs; town clerk's office; east side of building, near north-east corner, 3 feet above ground; permanent bench mark; aluminum tablet, marked "A 1120"	1, 120. 319
Slaterville Springs, 1 mile east of, 300 feet east of house of J. R. Thomas, 5 feet south of road; chisel mark on boulder.....	1, 208. 91
Caroline, 1 mile west of, in front yard of Martin Yaples's house, north side of road; nail in southwest root of westernmost of three maple trees in a row	1, 272. 33
Caroline, $\frac{1}{4}$ mile west of; northwest corner of road north; nail in root west side of large maple tree.....	1, 278. 28

CAROLINE TO SPEEDSVILLE, VIA WEST OWEGO CREEK.

Caroline, $\frac{1}{2}$ mile east of, and 450 feet east of bridge over West Owego Creek; nail in root east side of large pine tree, north side of road opposite Orrin Rich's residence.....	1, 272. 85
Caroline, $1\frac{1}{2}$ miles east of; 100 feet northwest of ——— Woodroy's house; nail in northwest root of large maple tree, northwest side of road	1, 239. 65
Caroline, 3 miles southeast of; 75 feet southeast of schoolhouse; nail in west root of ash tree in lot, 3 feet west of fence west side of road	1, 183. 66
Speedsville, 3 miles north of; opposite house of L. M. Walker; chisel mark on top of foundation at northeast corner of red barn, west side of road.	1, 180. 93
Speedsville, 2 miles north of, opposite Rawson's Hollow grist mill, 400 feet north of road corner, 15 feet west of road; nail in northeast root of large prominent elm tree.....	1, 145. 31
Speedsville, 1 mile north of, 50 feet south of stream crossing to west; nail in stump just east of road inside fence.....	1, 097. 84
Speedsville, O. F. Freeland's store; west side of building, 8 feet north of southwest corner, in top course of masonry foundation; aluminum tablet, marked "A 1121"	1, 120. 900

SPEEDSVILLE TO WILSEYVILLE, VIA SHINDAGEN GULF AND PERRYVILLE.

Speedsville, 1 mile northwest of; 30 feet west of wooden bridge over Boyer Creek; nail in root northwest side of small maple tree, south side of road near fence	1, 141. 76
Speedsville, $1\frac{1}{2}$ miles west of, at southeast corner of road to south; nail in root north side of large maple tree	1, 406. 74
Speedsville, 4 miles west of, near head of Shindagen Gulf, at intersection with road from Caroline Center; nail in hickory stump just east of small hickory tree on west side of road	1, 466. 33
Perryville, $2\frac{1}{2}$ miles north of, in Shindagen Gulf, 30 feet west of wooden bridge over stream; nail in root north side of apple tree, 30 feet south of road.....	1, 136. 24
Perryville, $1\frac{1}{2}$ miles north of; chisel mark on northeast corner of stone step of schoolhouse west side of road.....	1, 077. 68
Perryville, $\frac{1}{4}$ mile north of; chisel mark on northwest corner of stone in front of horse trough on east side of road.....	1, 061. 76
Perryville schoolhouse, east side of road; chisel mark west end of first stone step from top, south of door.....	1, 009. 19
Wilseyville, 2 miles south of, at intersection of roads from Perryville and Candor; nail in root east side of southernmost of three maple trees, west side of road by fence.....	932. 08
Wilseyville, $\frac{1}{4}$ mile south of, at Delaware, Lackawanna and Western Railroad crossing; top of rail.....	942. 4
Wilseyville, $\frac{1}{4}$ mile south of, 900 feet north of Delaware, Lackawanna and Western Railroad crossing; nail in northwest root of southernmost of five maple trees in row against east road fence.....	937. 60

	Feet.
Wilseyville, $\frac{1}{2}$ mile south of; top of rail at Lehigh Valley Railroad crossing.....	934. 8
Wilseyville, Stevens Hotel; chisel mark on south end of stone step, east end of walk between driveway and building	947. 38

CAROLINE TO ETNA VIA DRYDEN LAKE AND DRYDEN..

Caroline, $1\frac{1}{2}$ miles north of, at West Owego Creek; chisel mark on abutment at southwest corner of bridge	1, 304. 28
Caroline, 3 miles northeast of, 500 feet northeast of Henry Jones's residence, on northwest side of road; $\frac{3}{4}$ mile south of white schoolhouse; nail in southeast root of maple tree, northwest side of road	1, 445. 58
Caroline, $3\frac{1}{2}$ miles northeast of; southwest corner of road to south; nail in root east side of apple tree, 20 feet from road in field	1, 533. 26
Caroline, $4\frac{1}{2}$ miles northeast of, about 2 miles west of Harford; chisel mark on outcrop at east corner of triangle of grass in center of roads at road north to Dryden	1, 569. 34
Dryden, 4 miles south of; 1,200 feet northwest from corner of road from summit of divide, in fence line in front of house on west side of road; bowlder, opposite southeast line of house, marked with chisel	1, 277. 17
Dryden, 3 miles south of, at forks in road; chisel mark on bowlder at east side of west road 30 feet north of apex of roads	1, 292. 67
Dryden, 2 miles south of; 100 feet south of Lehigh Valley Railroad crossing; east side of road against fence; nail in top of stump.....	1, 165. 64
Dryden, 2 miles south of; top of rail, first crossing of Lehigh Valley Railroad north of Dryden Lake.....	1, 161. 6
Dryden, $1\frac{1}{4}$ miles south of; Lehigh Valley Railroad crossing, top of rail ..	1, 158. 4
Dryden, $1\frac{1}{4}$ miles south of; Lehigh Valley Railroad crossing, top of rail ..	1, 143. 7
Dryden, $\frac{1}{2}$ mile south of Four Corners and 430 feet south of South street crossing of Lehigh Valley Railroad; cross cut in stone monument, west side of track, marking north end of tangent, and bearing legend 58+68 on side toward the track	1, 103. 13
Dryden, South street crossing, top of rail.....	1, 100. 7
Dryden, intersection South and Main streets; top of fire plug in northeast corner	1, 092. 54
Dryden, Southworth Library Building; aluminum tablet, set in foundation course of masonry south front of structure, marked "A 1090"	1, 098. 466
Dryden, $\frac{3}{4}$ mile west of Four Corners; Main street crossing of Lehigh Valley Railroad; top of rail.....	1, 078. 1
Dryden, $1\frac{1}{4}$ miles west of; nail in root on north side of evergreen tree outside of fence at west side of drive to house of — Savery, south side of road	1, 180. 14
Dryden, 2 miles west of, at Willow Glen Cemetery; northwest corner of stone horse block	1, 187. 3
Etna, $1\frac{1}{4}$ miles east of, opposite road to south; nail in root west side of large maple tree at west end of drive in yard of C. F. King	1, 125. 69
Etna, $\frac{1}{2}$ mile southeast of, 30 feet west of corner of road to north; chisel mark on bowlder, north side of road against fence	1, 096. 55
Etna, Lehigh Valley Railroad station; top of rail opposite east line of building.....	1, 024. 5

ETNA TO VARNA.

Etna, $1\frac{1}{4}$ miles southwest of, opposite residence of A. Snyder; top of railroad rail used as hitching post	999. 48
Varna, 1 mile northeast of, at road south across Fall Creek; chisel mark on bowlder southeast corner of roads.....	1, 014. 56

TRIANGULATION AND SPIRIT LEVELING.

327

	Feet.
Varna, $\frac{1}{4}$ mile northeast of, at iron highway bridge over Fall Creek; chisel mark west end south abutment.....	955.38
Varna, $\frac{1}{4}$ mile northeast of, on Lehigh Valley Railroad; top of rail at highway crossing.....	1,014.6
Varna, top of rail opposite west line of station	996.5
Varna, 100 feet west of station and 100 feet north of track; nail in stump in field.....	995.37

VARNA TO BESEMERS VIA LEHIGH VALLEY RAILROAD AND EAST ITHACA.

Varna, 1 mile southwest of; top of rail at highway crossing.....	964.2
Varna, $1\frac{1}{2}$ miles southwest of; top of rail at highway crossing.....	944.0
Varna, $1\frac{1}{2}$ miles southwest of; 1,200 feet west of milepost 52, on north side of track; iron pin in boulder (Lehigh Valley Railroad bench mark 51..	934.50
East Ithaca, $\frac{1}{4}$ mile northeast of; abutment southwest corner of iron railway bridge over Cascadilla Creek; iron pin (Lehigh Valley Railroad bench mark 50 ³).....	865.79
East Ithaca, Lehigh Valley Railroad station; upper course of masonry foundation showing north of ticket-office window on east side of station; southeast corner of south stone.....	873.12
East Ithaca, top of west rail of main track, opposite south line of station..	872.0
East Ithaca, $\frac{1}{4}$ mile south of; top of rail at highway crossing.....	868.6
Ithaca, Cornell University, civil engineering building; bottom course of foundation, south end of building, 5 feet east of the southwest corner; aluminum tablet marked "A 814"	814.025
East Ithaca, $\frac{1}{4}$ mile southeast of; top of rail at highway crossing.....	886.7
East Ithaca, $1\frac{1}{2}$ miles southeast of, 450 feet northwest of highway crossing and 20 feet north of track; iron pin set in large boulder (Lehigh Valley Railroad bench mark 49).....	900.29
East Ithaca, $1\frac{1}{2}$ miles southeast of, at highway crossing; top of rail.....	902.3
East Ithaca, $2\frac{1}{2}$ miles southeast of, $\frac{1}{4}$ mile west of small white schoolhouse among pines on south side of track, and immediately west of private road crossing; iron pin set in boulder 20 feet north of track (Lehigh Valley Railroad bench mark 47 ²).....	942.42
East Ithaca, $2\frac{1}{2}$ miles southeast of; spike in north side of small white schoolhouse south of track among pines	932.7
Besemers, $1\frac{1}{2}$ miles west of; in field 50 feet north of track; hickory tree, blazed and painted "B. M. 46;" spike in root (Lehigh Valley Railroad bench mark —.)	951.31
Besemers, 1 mile west of; top of rail on bridge over highway.....	945.8
Besemers, northeast corner of station; spike in north root of stump.....	959.78

ETNA TO M'LEAN.

Etna, north side of Baptist church driveway; nail in north root of maple tree 15 feet from road	1,026.31
Freeville, 2 miles west of; iron highway bridge over Fall Creek; chisel mark west end of south abutment.....	1,026.4
Freeville, 1 mile west of; iron highway bridge over Fall Creek; chisel mark east end of north abutment	1,030.1
Freeville, crossing of Elmira, Cortland and Northern and Auburn divisions of Lehigh Valley Railroad; top of rail	1,046.3
Freeville, Lehigh Valley Railroad freight house; west side of fourth pedestal from south end under freight platform; chisel mark.....	1,046.27
McLean, north of small bridge at west side of square and south of store and post-office; square chisel mark in east wall of mill race, with legend "U.S.G.S. 1123"	1,118.57

MONTGOMERY AND SCHOHARIE COUNTIES.

CANAJOHARIE AND SCHOHARIE QUADRANGLES.

The elevations published in the following list are based on a bronze tablet set in a foundation stone in the northwest corner of the Union School building in Cobleskill and marked "930 Albany 1898." The elevation of this bench mark above mean sea level is derived from the line of precise levels run by Mr. E. L. McNair of this Survey during the current field season, and based on the Gristmill bench mark at Albany.

The elevation accepted for this Cobleskill bench mark is 929.101 feet above mean sea level.

The leveling was executed under the direction of Mr. C. C. Bassett, topographer, by Mr. Clark Brown, levelman.

All bench marks dependent on this datum are marked with the letter "A," thus referring them to Albany as a datum.

CANAJOHARIE TO AMES.

	Feet.
Canajoharie, Union Free School; west front, south of stone steps, in stone balustrade; aluminum tablet, marked "A 350"	349.843
Canajoharie, 2½ miles south of, at large arch bridge; northwest corner of west wall, north wing, marked with painted square	658.65
Marshville, schoolhouse; south end of doorsill	675.26
Ames, 1 mile north of, 100 feet north of road to east; boulder 4 feet broad by east road fence; marked with painted square	694.40

BLAINE TO SHARON.

Blaine; coping of cemetery wall, 50 feet from east end; aluminum tablet, marked "A 943"	942.857
Montgomery and Schoharie County line; 40 feet east of cross roads near; highest point of boulder 4 feet broad, 5 feet north of road	1235.80
Sharon, opposite Lutheran church and schoolhouse; outcropping ledge in field, southwest of road; aluminum tablet, marked "A 1212"	1211.364
Little York, schoolhouse; east end of west doorsill	1289.10

SHARON TO SHARON SPRINGS STATION VIA SHARON CENTER AND SHARON SPRINGS.

Sharon, 2 miles west of, in schoolhouse yard; notched root of maple tree	1486.55
Sharon Center, schoolhouse; north end of doorsill	1437.31
Sharon Springs, northwest corner of turnpike and road to spa; top of fire hydrant	1307.21
Sharon Springs, 700 feet north of main east and west road through Rockville, 500 feet from top of hill, in outcrop on west side of street; aluminum tablet, marked "A 1295"	1294.549

SHARON SPRINGS STATION TO SPROUT BROOK VIA LEESVILLE.

Leesville, railroad crossing at west side of; highest point on boulder 30 feet east of crossing by north road fence	1333.91
Leesville, 1½ miles west of; 40 feet north of railroad crossing, 10 feet east of road; highest point of outcrop	1384.6
Sprout Brook, 1 mile south of, at road corner; south end of schoolhouse doorsill	783.27

TRIANGULATION AND SPIRIT LEVELING.

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SPROUT BROOK TO BLAINE VIA BUELL.

	Feet.
Sprout Brook, iron bridge; west end of south abutment; parapet marked with paint.....	725. 50
Sprout Brook, $\frac{1}{4}$ mile east of; iron bridge; south abutment, east end, face corner coping, marked with painted square.....	714. 88
Buell, 1,000 feet east of church; northeast corner of east end of front foundation wall.....	723. 44
Ames, 1 mile west of, at iron bridge; west abutment, north end, face corner; marked with paint.....	692. 02
Blaine, 1 mile west of; south end of doorsill of schoolhouse.....	730. 56

SPROUT BROOK TO HESSVILLE.

Hessville; $\frac{1}{4}$ mile south of schoolhouse, 150 feet north of road to west, opposite house and 15 feet east of road, in bowlder 8 feet broad; aluminum tablet, marked "A 826"	825. 529
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FORT PLAIN TO HALLSVILLE.

Fort Plain, Erie Canal Lock No. 32; towpath coping, end of anchor, northeast gate; chiseled cross within chiseled circle (Canal B. M. No. 171)...	311. 576
Fort Plain, Union Free School; Division street front, water table 1 foot from south corner; aluminum tablet, marked "A 316"	316. 515
Fort Plain, $1\frac{1}{4}$ miles west of; valley schoolhouse; west end of doorsill....	393. 96
Hallsville, south end of cheese factory, stone foundation 1 foot from east corner; aluminum tablet, marked "A 509"	508. 667

LITTLE YORK TO BARNERVILLE.

Little York, $1\frac{1}{4}$ miles south of, iron bridge at road forks; anchor bolt southwest corner of bridge.....	1262. 86
Little York, $2\frac{1}{4}$ miles south of, at rock schoolhouse; notch in root of 2-foot maple tree in school yard	1384. 96
Barnerville, 4 miles northwest of, at cross roads, 15 feet northeast of intersection of roads; highest point on bowlder.....	1366. 78
Barnerville, 2 miles northwest of, at Shutts Corners schoolhouse; east end of east doorsill.....	1145. 48
Barnerville, 1 mile northwest of; Delaware and Hudson Railroad crossing; bowlder 20 feet north of track and 5 feet east of road; chiseled square..	903. 34
Barnerville, 200 feet west of covered bridge, 100 feet north of Main street, at iron bridge over mill race; south abutment, east wing; aluminum tablet, marked "A 827"	826. 756

BARNERVILLE TO SCHOHARIE VIA EAST COBLESKILL.

Barnerville, top of hill southeast of; 300 feet east of north and south road; white house, southwest corner of foundation; projecting stone 6 inches long, 7 inches from corner and 4 inches from face; highest point.....	1071. 40
East Cobleskill, 0.08 mile east of; at summit by small cemetery; notch in root of large pine tree $2\frac{1}{4}$ feet in diameter south of road.....	1169. 80
Schoharie, $2\frac{1}{4}$ miles west of; notched root of large pine tree $2\frac{1}{4}$ feet in diameter in schoolhouse yard.....	1122. 09
Schoharie, 1 mile west of, 600 feet south of bridge across road, 30 feet west of north and south road; notched root of 8-inch elm tree by north road fence	740. 11
Schoharie, court-house; south side of south door in west front; beveled jamb; aluminum tablet, marked "A 611"	610. 577

SCHOHARIE TO COBLESKILL VIA MIDDLEBURG, FULTONHAM, WATSONVILLE, WEST FULTON,
AND WARNERVILLE.

	Feet.
Schoharie, 1½ miles south of Bridge street; on railroad bridge; north abutment, west wing, second step; dome-like fossil 6 inches from face.....	608.93
Middleburg, 2 miles north of, 300 feet south of railroad crossing; maple tree 3½ feet in diameter; notch in root.....	618.51
Middleburg, 250 feet east of old church, south side of street; top of fire hydrant	632.85
Middleburg, 100 feet south of east entrance to covered bridge over Schoharie Creek; top of fire hydrant.....	634.23
Middleburg, schoolhouse, east front, south of entrance, in foundation wall; aluminum tablet, marked "A 649"	649.051
Middleburg, 1½ miles southwest of, at schoolhouse; south end of sill of door nearest road	650.75
Watsonville, at road to northwest; double-trunk locust tree 2 feet in diameter in southwest corner of roads; notch on root.....	690.23
Fultonham, schoolhouse; pine tree, 3 feet in diameter, in grounds; notch on root	703.5
Breakabeen, 1½ miles north of, 300 feet north of road corner; iron bridge over Panther Creek; north abutment, west end, face corner, marked with chiseled square	727.64
West Fulton, iron bridge near four corners; south abutment, east end, face corner, marked with chiseled square.....	1156.06
West Fulton, iron bridge across Panther Creek; south abutment, east end, in coping; aluminum tablet, marked "A 1156"	1156.650
West Fulton, 1½ miles north of, 100 feet south of iron bridge, 10 feet west of and 1 foot above road; chiseled square on outcrop.....	1246.08
West Fulton, 3 miles north of, ½ mile south of Vintonton; south end of doorsill, schoolhouse.....	1389.93
Warnerville, 2½ miles south of, at road corner ½ mile east of summit; maple tree 1 foot in diameter, by south road fence 50 feet east of road corner; notched point on root.....	1915.9
Warnerville, ½ mile south of, at fork of road near sawmill; elm tree, 3 feet in diameter, in east corner; notch on root.....	1023.12
Cobleskill, 7 miles west of, at second road crossing Delaware and Hudson Railroad, west of main road to Warnerville; cattle guard, southwest corner, west wall; face corner, marked with chiseled square.....	948.72
Breakabeen, Lutheran church; foundation west side 5 feet from front corner; aluminum tablet, marked "A 754"	753.823

MIDDLEBURG TO FRANKLINTON.

Middleburg, south end of village, at northeast corner of road, north; top of fire hydrant.....	721.29
Middleburg, 1½ miles southeast of; iron bridge, north abutment, east wing, bridge seat, chiseled square	742.97
Middleburg, 3 miles south of, at road to west; boulder, 15 feet east of road opposite corner of barn; chiseled square	959.43
Middleburg, 4 miles south of, 150 feet south of summit; pine tree 18 inches in diameter, notch in root.....	1278.18
Franklinton, at schoolhouse, southwest corner of foundation; aluminum tablet, marked "A 1215"	1214.407
Franklinton, 1½ miles south of, road to west across foot of pond, 50 feet west of north and south road; chiseled square on boulder	1161.98

MONROE, ONTARIO, WAYNE, SENECA, CAYUGA, ONONDAGA, AND
OSWEGO COUNTIES.

MACEDON, NEWARK, LYONS, WEEDSPORT, OSWEGO, FULTON, AND BALDWINVILLE
QUADRANGLES.

The elevations published in the following list are based on an aluminum tablet set in the post-office building in Oswego and marked "295 OSWGO." The elevation of this bench mark is accepted as 294,738 feet above mean sea level as determined by reference to the United States Engineer Corps bench mark on stone pier in Oswego. This initial bench mark and that of the United States Engineer Corps on the old light-house at Charlotte have been reduced to mean sea level in accordance with the factors published on page 203 of the Appendix to Part I of the Nineteenth Annual Report.

The leveling was done under the direction of Messrs. E. B. Clark and J. H. Wheat, topographers, by Messrs. C. H. Semper and D. E. Baxter, levelmen.

All bench marks dependent upon this datum are marked with the letters "OSWGO," in addition to the figures of elevation.

CHARLOTTE TO OSWEGO, ALONG THE ROME, WATERTOWN AND OGDENSBURG RAILROAD.

	Feet.
Charlotte; upper side of water table of old light-house at the south south-east angle east of the south window; United States Engineer's bench mark	282.15
Genesee River; railroad swing bridge over; on southwest corner of west abutment of bridge on top of parapet wall; chiseled square	256.15
Windsor; Rome, Watertown and Ogdensburg Railroad station; cement foundation of first post of station east of building; chiseled square.....	277.45
Windsor, 1.4 miles east of; 400 feet west of through cut; north of track; large marble rock; chiseled square	266.84
Irondequoit; Lake Shore Hotel; top of rail opposite	269.2
Irondequoit Bay; Rome, Watertown and Ogdensburg Railroad bridge over outlet of; fourth step of east abutment, north side of track; chiseled square on northeast corner	251.22
Forest Lawn, 0.8 mile west of; railroad bridge over Webster road; on west abutment, north side of top step; chiseled square	265.48
Forest Lawn, 1.1 miles east of; road crossing; top of rail	308.5
Forest Lawn, 2.3 miles east of; road crossing; top of rail	370.6
Webster, 1.7 miles west of; on rock on east side of Klem road crossing, 20 feet south of track; chiseled square	376.02
Webster, 0.9 mile west of; at road crossing, top of rail	388.0
Webster, 0.9 mile west of; on top of stone road culvert north side of track, east wall of culvert; marked □ with chisel	388.47
Webster, Main street crossing of Rome, Watertown, and Ogdensburg Railroad, 60 feet south of; in front of coal office on east side of road, on rock; marked □ with chisel	405.54
Webster, 0.4 mile east of; road crossing, top of rail	410.1
Webster, 1.4 miles east of; road crossing, top of rail	418.1
Webster, 1.9 miles east of; on bowlder 25 feet north of track on farm crossing; marked □ with chisel	419.69
Webster, 2 miles east of; road crossing, top of rail	421.2
Union Hill station; road crossing, top of rail	424.7

	Feet.
Union Hill station; boulder on east side of highway 20 feet north of railroad; marked □ with chisel.....	422.89
Lakeside station, on west wall of railroad culvert, north side of track, 600 feet west of station, on top step of; marked □ with chisel.....	420.55
Lakeside, highway crossing east of; top of rail.....	423.0
Lakeside, 0.7 mile east of; road crossing, top of rail.....	420.2
Ontario Center, Main street crossing on top of sluice culvert 5 feet south of track, on east end of culvert; marked □ with chisel.....	430.24
Ontario Center, 0.5 miles east of; on railroad culvert, northwest end; marked □ with chisel.....	420.19
Ontario Center, 1.1 miles east of; on boulder at end of railroad culvert in highway 400 feet west of Ontario station, 10 feet north of track; marked □ with chisel.....	410.93
Ontario, top of rail in front of station.....	413.6
Ontario, 0.2 mile east of; road crossing, top of rail.....	408.2
Ontario, 1.7 miles east of; on boulder at end of culvert 20 feet north of track on east side of highway; marked □ with chisel.....	409.59
Ontario, 1.7 miles east of; road crossing, on top of rail.....	412.0
Ontario, 2.5 miles east of; on large boulder south of track, 15 feet from fence; marked □ with chisel.....	421.45
Ontario, 3.4 miles east of; on railroad culvert 50 feet east of highway on north side of track; marked □ with chisel.....	406.75
Ontario, 3.5 miles east of; highway, top of rail.....	410.9
Ontario, 4.3 miles east of; highway, top of rail.....	412.0
Ontario, 4.3 miles east of; on boulder 40 feet south of track and 30 feet east of highway; marked □ with chisel.....	408.17
Williamson station, top of rail at.....	419.1
Williamson, on northwest corner of road crossing 400 east of station, 15 feet north of track, on boulder; marked □ with chisel.....	417.01
Williamson, 0.8 mile east of; top of rail at road crossing.....	429.1
Williamson, 0.9 mile east of; on large rock north of railroad 900 feet east of highway; marked □ with chisel.....	423.34
East Williamson; road crossing; top of rail.....	416.0
Williamson, 2.1 miles east of; on boulder at base of mail stand on south side of track; road crossing marked □ with chisel.....	415.56
Williamson, 3 miles east of; on boulder 25 feet south of track on east side of highway; marked □ with chisel.....	424.46
Williamson, 3 miles east of; crossroad, top of rail.....	422.6
Williamson, 3.8 miles east of; road crossing; top of rail.....	408.6
Williamson, 3.8 miles east of; on large boulder on west side of road north of railroad track at corner of fence; marked □ with chisel.....	407.87
Williamson, 4.9 miles east of; road crossing; top of rail.....	416.1
Williamson, 4.9 miles east of; on boulder 8 feet north of track; 1 foot east of highway; marked □ with chisel.....	415.16
Williamson, 6.1 miles east of; road crossing; top of rail.....	428.6
Sodus; highway crossing; main track; top of rail.....	427.8
Sodus; on large boulder 20 feet north of track; 15 feet east of highway at station; marked □ with chisel.....	427.53
Sodus; aluminum tablet in water table at southwest corner of Third M. E. Church on Ridge road; marked "457 O".....	457.245
Sodus, 0.2 mile east of; road crossing; top of rail.....	428.1
Sodus, 0.3 mile east of; road crossing; top of rail.....	432.0
Sodus, 1.5 miles east of; road crossing; top of rail.....	427.1
Sodus, 1.5 miles east of; on boulder in highway 15 feet south of track and 5 feet west of fence; marked □ with chisel.....	423.75
Sodus, 2 miles east of; road crossing; top of rail.....	419.9

TRIANGULATION AND SPIRIT LEVELING.

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	Fect.
Sodus, 2.4 miles east of; on large boulder flush with ground; 100 feet south of railroad; east side of road in front of small yellow house; marked □ with chisel.....	396.47
Sodus, 2.4 miles east of; road crossing; top of rail.....	397.9
Wallington; on southwest corner of stone foundation of railroad water tank; marked □ with chisel.....	404.89
Wallington, 0.9 mile east of; on large boulder 25 feet north of railroad track and 35 feet west of milepost, 114 S. B.; cut □ with chisel.....	389.48
Wallington, 1.3 miles east of; highway crossing; top of rail.....	381.8
Alton; highway crossing; top of north rail.....	401.8
Alton; on large boulder in bank in southeast corner, 20 feet east of center of road and 8 feet south of track; cut □ with chisel.....	401.41
Alton, 0.3 mile east of; top of rail at highway crossing.....	400.6
Alton, 0.5 mile east of; highway crossing; top of north rail.....	407.5
Alton, 0.5 mile east of; boulder in ditch in northeast corner; 3 feet from center of highway and 10 feet from track; cut □ with chisel.....	406.86
Alton, 1.2 miles east of; on large boulder 290 feet west of center of highway crossing on north bank; cut □ with chisel.....	403.53
Alton, 1.2 miles east of; highway crossing; top of north rail.....	400.9
Alton, 2 miles east of; road crossing; milepost, S. B. 117, top of north rail.....	399.4
Alton, 2 miles east of; stone in southeast corner of road crossing, 23 feet east of center of road and 2 feet south of railroad track; cut □ with chisel.....	398.65
Alton, 2.3 miles east of; (Dunbar's) road crossing; top of north rail.....	392.7
Alton, 2.5 miles east of; highway crossing; top of rail.....	392.6
Alton, 2.9 miles east of; private road crossing; continuation of public highway, 500 feet to north near S. B. 118.....	394.5
Alton, 3.3 miles east of; spike in telegraph pole on south side of public highway running parallel to railroad and tangent at this point; in front of buff-colored house.....	389.38
Alton, 4 miles east of; on large boulder 12 feet north of track and 800 feet east of highway and at east end of high railroad fill; 200 feet west of milepost, S. B. 119; marked □ on top, also "382 O".....	382.13
Alton, 3.9 miles east of; highway crossing; top of north rail.....	382.7
Alton, 4.9 miles east of; highway crossing; top of rail; at North Rose.....	388.0
Alton, 4.9 miles east of; spike in telegraph pole on southeast corner; 10 feet east of highway and 5 feet south of switch at road crossing at North Rose.....	388.46
North Rose; elevation in front of station; top of rail.....	386.80
North Rose, 0.5 mile east of; on south end of west abutment of open-top culvert for small stream; cut □ with chisel.....	379.47
North Rose, 1.3 miles east of; at road crossing; top of rail.....	399.7
North Rose, 1.6 miles east of; large boulder, northeast corner of road crossing; 12 feet north of track and 15 feet east of railroad; 2 feet below track level; cut □ on top with chisel.....	385.14
North Rose, 1.6 miles east of; highway crossing; top of north rail.....	387.5
North Rose, 2.1 miles east of; highway crossing; section post No 25; top of north rail.....	361.7
North Rose, 2.3 miles east of; middle of south end of masonry culvert; 600 feet west of highway crossing; cut □ with chisel.....	355.41
North Rose, 2.4 miles east of; highway crossing; top of north rail.....	355.8
North Rose, 2.4 miles east of; top of north rail; over culvert; large drain.....	355.7
North Rose, 3.2 miles east of; highway crossing; top of north rail.....	363.9
North Rose, 3.3 miles east of; large boulder at west edge of highway; 35 feet north of tracks; cut □ with chisel.....	361.38
North Rose, 3.8 miles east of; highway crossing; top of north rail.....	362.5

	Feet.
Wolcott; Main street highway crossing; top of north rail.....	360.7
Wolcott, 4.6 miles east of North Rose; 75 feet west of Rome, Watertown and Ogdensburg station; on large bowlder; on southwest corner of highway crossing; marked □ with chisel	361.32
Wolcott, 0.2 mile east of; highway crossing; top of north rail.....	355.9
Wolcott, 0.9 mile east of; highway crossing; top of north rail.....	358.0
Wolcott, 0.9 mile east of; on bowlder in east end of highway drain; 6 feet north of railroad track.....	357.19
Wolcott, 0.9 mile east of; highway crossing; top of north rail	359.0
Wolcott, 1.7 miles east of; highway crossing; top of north rail.....	394.0
Wolcott, 1.7 miles east of; on large bowlder, 2 feet east of west margin of highway and 30 feet north of railroad; cut □ with chisel	393.34
Wolcott, 2.4 miles east of; on large bowlder 6 feet north of track and midway between highway crossings; cut □ with chisel	422.24
Wolcott, 3 miles east of; highway crossing; top of north rail	423.1
Wolcott, 3 miles east of; 10 feet east of center of highway and 28 feet south of railroad; at foot of post holding railroad danger signal; cut □ with chisel	423.35
Wolcott, 4.2 miles east of; on large bowlder in southwest angle of highway crossing; 4 feet north of railroad track and 20 feet from center of highway; cut □ with chisel	408.54
Red Creek, 1.6 miles west of; large bowlder in southwest angle of road crossing; 4 feet from track and 20 feet from center of highway; cut □ on top with chisel.....	408.54
Red Creek, 1.6 miles southwest of; top of rail at highway crossing.....	407.6
Red Creek; aluminum tablet in stone foundation of Red Creek Academy, situated on Second street; 225 feet north of Rome, Watertown and Ogdensburg Railroad, on west side of street, marked "355 OSWGO" ..	355.400
Red Creek, road crossing; top of rail; 200 feet west of station	334.3
Sterling, 4.6 miles southwest of; top step of east end of south abutment of railroad bridge over Red Creek; cut □ with chisel.....	333.59
Sterling, 4.5 miles southwest of; top of rail at highway crossing.....	335.0
Sterling, 3.7 miles southwest of; top of rail at highway crossing.....	325.8
Sterling, 2.5 miles southwest of; on top of bowlder 15 feet east of railroad and 10 feet north of highway; cut □ on top with chisel.....	327.10
Sterling, 2.5 miles southwest of; top of rail at road crossing	324.7
Sterling, 2.1 miles southwest of; fourth step, north abutment, east wing of railroad bridge over highway; cut □ with chisel.....	338.47
Sterling, 1.5 miles southwest of; on large bowlder 5 feet south of track and 125 feet west of center of highway; cut □ on top with chisel.....	361.15
Sterling, 1.5 miles southwest of; top of rail at road crossing.....	363.7
Sterling, 0.9 mile southwest of; top of rail at road crossing.....	365.7
Sterling, 0.5 mile southwest of; under wooden highway bridge, top of rail.	348.4
Sterling, spike in telegraph pole; on south side of station; 60 feet west of west end of railroad station and 175 feet west of railroad crossing, Rome, Watertown and Ogdensburg and Lehigh Valley railroads	322.10
Sterling; top of rail at crossing of Rome, Watertown and Ogdensburg and Lehigh Valley railroads.....	320.0
Crockett, 2 miles southwest of; west abutment, north wing of open culvert; cut □ with chisel.....	301.85
Crockett, 1.8 miles southwest of; east abutment, north side of bridge; cut □ with chisel	305.96
Crockett, 1.6 miles southwest of; road crossing; top of rail.....	309.5
Crockett, 1.3 miles southwest of; large rock 25 feet west of railroad and 20 feet north of center of public road; cut □ on top with chisel.....	305.17

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Crockett, 0.4 mile southwest of; top of north abutment, west end of open culvert; cut □ with chisel	327.99
Crockett, 0.3 mile southwest of; top of rail at road crossing	331.2
Hannibal, 2.6 miles west of; large bowlder 5 feet south of switching track and 200 feet east of Crockett station; cut □ with chisel	333.88
Hannibal, 1.6 miles west of; bridge No. 29, top of north side of east abutment; cut □ with chisel	321.81
Hannibal, 1.2 miles west of; large bowlder 15 feet north of track and 60 feet west of ringing post; cut □ on top with chisel	339.56
Hannibal, 1 mile west of; road crossing; top of rail	351.6
Hannibal, 1 mile west of; large bowlder 80 feet north of track and 75 feet east of center of road crossing; cut □ on top with chisel	350.36
Hannibal, schoolhouse on Oswego street at; aluminum tablet in stone doorsill of north entrance; marked "354 OSWGO"	354.043
Furniss, 5 miles southwest of; road crossing; top of high rail	365.8
Furniss, 5 miles southwest of; large bowlder 10 feet west of track; 30 feet north of north margin of highway; cut □ with chisel	367.19
Furniss, 4.3 miles southwest of; large bowlder 10 feet west of track and 1 foot below track level; 1,000 feet north of milepost 142; cut □ on top with chisel	363.27
Furniss, 3.6 miles southwest of; on large bowlder northeast angle of crossing; 2 feet east of track; cut □ with chisel	366.25
Furniss, 3.6 miles southwest of; road crossing; top of high rail	367.8
Furniss, 3.1 miles southwest of; large bowlder 3 feet west of south end of Wheeler station; cut □ with chisel	368.24
Furniss, 2.4 miles southwest of; on rock in bank; 6 feet west of track; 750 feet north of milepost, S. B. 144; cut □ on top with chisel	375.39
Furniss, 1.5 miles southwest of; on east side of north abutment of large open culvert; cut □ with chisel	365.11
Furniss, 1 mile southwest of; large bowlder on west end of road; drain 12 feet east of track; 12 feet north of fence line; on south side of fence line; cut □ with chisel	356.34
Furniss, top of large bowlder between main track and switch track; 90 feet south of south end of station	358.14
Oswego, 3.9 miles southwest of; on bowlder 15 feet west of track and 20 feet north of ringing post on east of track; cut □ with chisel	328.30
Oswego, 3 miles southwest of; on rock 20 feet east of track; 15 feet north of post marked section 11; cut □ on top with chisel	351.65
Oswego, 2.3 miles southwest of; on bowlder 5 feet west of track; 50 feet north of small butternut tree on fence line; 1,500 feet north of highway bridge over railroad; cut □ on top with chisel	353.33
Oswego; 1.3 miles from Government bench mark at foot of Third street; on top of east end of north wall of Rome, Watertown and Ogdensburg Railroad bridge abutment over Erie street; cut □ on top with chisel ...	308.81
Oswego; large bowlder on southwest corner of Utica and Fourth streets; 10 feet from small switch house; cut □ with chisel	303.87
Oswego; top of iron bolt flush with top of masonry of old United States stone pier at foot of West Third street, 5 feet back from east face of pier and 3.5 feet north of wharf line of south side of basin; marked $\begin{smallmatrix} \text{U S} \\ + \\ \text{B M} \end{smallmatrix}$	250.88
Oswego; post-office building, corner of Oneida and West First streets; water table northeast corner; aluminum tablet, marked "295 OSWGO".	294.738
WEBSTER TO FAIRPORT.	
Webster, 100 feet south of Ridge road, in front of L. Schermerhorn's house; base of southwest corner of cement stepping stone; chiseled square	459.55

	Feet.
Webster; Union Academy; in water table at northeast corner of building; aluminum tablet, marked "463 OSWGO".....	465. 215
Webster, 0.7 mile south of; 40 feet north of north side of brick house; on large boulder west side of road 5 feet from fence; chiseled square.....	488. 45
Webster, 1.1 miles south of; 180 feet north of north side of small white house east of road; on large boulder on west side of road; chiseled square.....	480. 68
Webster, 2.2 miles south of; 110 feet north of crossroad; on large boulder east side of road at end of culvert; chiseled square.....	483. 97
Webster, 2.5 miles south of; 340 feet north of north side of small white house; on large rock in ditch east side of road; chiseled square.....	499. 92
Webster, 3 miles south of, opposite schoolhouse at crossroads; on large boulder southwest corner of roads; chiseled square.....	515. 49
Webster, 4.4 miles south of; in front of William Spinks's house; chiseled square on stepping stone.....	520. 36
Webster, 5.3 miles south of; 40 feet south of south side of B. B. Clark's house; on large boulder east side of road; chiseled square.....	501. 05
Webster, 6.4 miles south of; 75 feet south of south side of Ed. Jordan's house; on large boulder west side of road; chiseled square.....	467. 63
Webster, 7 miles south of; in front of E. L. Hodgkins's farm; stepping stone on west side of road; chiseled square.....	466. 84
Fairport; southeast corner of High and Main streets; 100 feet north of New York Central and Hudson River Railroad; chiseled square on boulder.....	460. 04
Fairport; Main street; top of rail, track No. 2, New York Central and Hudson River Railroad.....	454. 9
Fairport; Main street; top of rail, West Shore Railroad.....	454. 7
Fairport, 100 feet east of Main street bridge over Erie Canal; top of post Erie Canal bench mark.....	465. 6
Fairport; Union School; in water table of Church street front; aluminum tablet marked "498 OSWGO".....	498. 054
Fairport, 0.6 mile east of; bridge No. 44 (F. P. Baker's) over Erie Canal; on east wing of abutment; chiseled square (Erie Canal bench mark).....	466. 564

ONTARIO CENTER TO PALMYRA, VIA WALWORTH.

Ontario Center, 0.7 mile south of; 48 feet south of old weather-stained house; on boulder, west side of road; chiseled square.....	440. 40
Ontario Center, 2.1 miles south of; 12 feet south of north side of John Newlin's house; on boulder, west side of road; chiseled square.....	472. 92
Ontario Center, 3 miles south of; 150 feet north of road intersection; boulder, east side of road 10 feet from fence; chiseled square.....	476. 65
Ontario Center, 4 miles south of; 115 feet north of old barn east side of road; on boulder west side of road; chiseled square.....	502. 25
Ontario Center, 5.2 miles south of; on stepping-stone in front of W. E. Clark's residence; chiseled square.....	531. 29
Ontario Center, 6.4 miles south of; in front of first house east of turn in road; on boulder at end of drain, west side of road; chiseled square ..	509. 12
Walworth; southwest corner of first road west of Main street; chiseled square on rock at foot of elm tree.....	535. 92
Walworth; Walworth Academy; water table at northwest corner of building; aluminum tablet marked "564 OSWGO".....	563. 895
Walworth, 0.2 mile south of; 1,200 feet north of Cragg's Roller Mills; on rock west side of road 15 feet from fence, and 50 feet south of small white house on east side of road; chiseled square.....	461. 27
Palmyra Aqueduct, 3 miles north of; 100 feet north of cross road; on boulder northeast side of road 2 feet from fence; chiseled square.....	516. 59

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Palmyra Aqueduct, 1 mile north of; 200 feet south of large square brick house; telegraph pole east side of road; spike in.....	475.78
Palmyra, 1 mile west of; Mud Creek Aqueduct; in buttress south wing west abutment; aluminum tablet marked "446 OSWGO"	445.817

WILLIAMSON TO MARION.

Williamson; Union Academy; northwest corner of building; aluminum tablet marked "454 OSWGO"	453.833
Williamson, 1 mile south of; 325 feet south of small white house west of road; on boulder, east side of road; chiseled square.....	491.53
Williamson, 2 miles south of; on standard scales platform east side of road; south drift bolt of east stringer.....	488.29
Williamson, 3 miles south of, at road east, 100 feet from corner; stone carriage step north side of road; chiseled square	490.06
Williamson, 3.6 miles south of, at crossroads; stone, flush with surface of ground, in west point of triangular grass plot formed by roads; chiseled square.....	459.89
Williamson, 4.3 miles south of; on rock, southwest corner of private road to house, 10 feet from fence corner; chiseled square.....	502.83
Williamson, 5.1 miles south of; within northern limit of the town of Marion; on rock at southeast corner of road to east at foot of maple tree by footpath; chiseled square.....	448.62
Marion, Presbyterian church; south end of east retaining wall of lawn; chiseled square	460.03
Marion; 500 feet north of the Four Corners; Main street front of the Marion Collegiate Institute; aluminum tablet marked "462 OSWGO"..	461.803

WALLINGTON TO NEWARK, ALONG NORTHERN CENTRAL RAILWAY.

Wallington, 0.9 mile south of; culvert No. 45, over Salmon Creek; northwest corner of masonry; chiseled square	404.89
Sodus Center, 0.3 mile south of; bridge No. 44, over Salmon Creek; on west wing of south abutment; chiseled square	410.02
Sodus Center, 2.1 miles south of; 25 feet north of center of highway crossing; on west end of north abutment of old masonry culvert (now filled in); chiseled square	422.74
Sodus Center, 3.4 miles south of; 10 feet east of railroad track; on top of large boulder forming north abutment of old culvert wall; chiseled square.....	432.51
Zurich; top of rail opposite station	440.5
Zurich; 25 feet south of center of highway; on large stone in west end of culvert; chiseled square	439.09
Zurich, 0.7 mile south of; 20 feet south of center of highway crossing; 25 feet west of railroad track; on boulder; chiseled square.....	430.42
Zurich, 1.9 miles south of; on large white boulder 8 feet east of tracks at foot of sand bank; chiseled square.....	421.90
Zurich, 3.3 miles south of; 8 feet east of railroad tracks; on large boulder in southeast angle of road crossing; chiseled square.....	482.21
Fairville; brick schoolhouse, district No. 2, 475 feet west of Northern Central Railway; in masonry foundation, 7 feet south of front entrance; aluminum tablet marked "456 OSWGO"	455.802
Fairville; 300 feet south of station; top step of west end of south abutment of large open culvert; chiseled square.....	418.64
Fairville, 0.9 mile south of; railroad bridge No. 40, over Mud Creek; on west end of south abutment; chiseled square.....	413.21

	Feet.
Fairville, 2.1 miles south of; 35 feet south of highway crossing; 10 feet east of railroad track; spike in east side of telegraph pole.....	411.58
Fairville, 2.9 miles south of; railroad bridge No. 37 over Mud Creek; chiseled square; west end of south abutment.....	415.36
Fairville, 3.4 miles south of; Northern Central Railway bridge over New York Central and Hudson River Railroad tracks; on top step, west end, south abutment; chiseled square. (This is Newark Station of N. Y. C. & H. R. R. R.).....	433.26
Newark; Charles street bridge over Erie Canal; towpath side; on bottom step, east wing; chiseled square.....	446.83
Newark; southwest corner of Charles and Miller streets; in water table of Miller street front, Baptist church, 1 foot from northeast corner; aluminum tablet, marked "457 OSWEGO".....	456.595
OSWEGO TO NEWPORT, VIA FULTON, PHOENIX, BALDWINVILLE, AND WARNERS.	
Oswego; top of fire plug, southwest corner of Third and Cayuga streets..	287.49
Oswego; crossing West Third street, over Delaware, Lackawanna and Western freight track; fire plug, northeast corner.....	300.63
Oswego, 1.9 miles south of; 250 feet southeast of switch on siding east of main track; 25 feet northwest of milepost, 15 feet east of siding; boulder marked □ with chisel.....	320.05
Oswego, 3.4 miles south of; Delaware, Lackawanna and Western Railroad; stone on east side of track opposite stone marking city limits; 10 feet from track; marked □ with chisel; 500 feet south of road crossing.....	334.21
Oswego, 4.6 miles south of; road crossing; 1 foot below crossing; boulder marked □ with chisel.....	329.29
Minetto; State dam, west side of Oswego River; southeast corner of third bulkhead pier on top of surface; aluminum tablet marked "302 A".....	302.314
Minetto, 0.07 mile south of; canal bench mark at Lock No. 12, Oswego Canal; copper bolt between cinchers of middle gate.....	307.51
Minetto, 1.3 miles south of; canal bench mark at bridge, west abutment, south wing, second step; copper bolt.....	310.25
Minetto, 0.3 mile south of; canal bench mark, guard lock No. 4, Oswego Canal; copper bolt between cinchers of middle gate.....	310.96
Minetto, 4.7 miles south of; canal bench mark, Oswego Canal, Lock No. 11; copper bolt middle hollow quoin between cinchers.....	319.11
Minetto, 5.5 miles south of; canal bench mark, Oswego Canal; copper bolt on first stone step; abutment, south end.....	321.39
Minetto, 5.5 miles south of; floor of highway bridge over canal.....	332.39
Minetto, 6.1 miles south of; canal bench mark, Oswego Canal; copper bolt on north hollow quoin between cinchers, Lock No. 10.....	327.91
Minetto, 5.9 miles south of; canal bench mark, Oswego Canal; copper bolt in first step of abutment south end.....	322.09
Minetto, 6.2 miles south of; canal bench mark, Oswego Canal, Lock No. 9; copper bolt in middle hollow quoin between cinchers.....	336.08
Fulton; northwest bolt in base of iron post of Main street bridge, north end of towpath fence.....	338.86
Fulton; aluminum tablet in town hall, northwest corner in water table; South First street; marked "363 A".....	363.446
Fulton, 0.5 mile south of; canal bench mark, Oswego Canal, Lock No. 8; copper bolt lower hollow quoin between cinchers.....	346.85
Fulton, 0.8 mile south of; canal bench mark, Oswego Canal; copper bolt; first step of abutment, south end.....	349.91

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Fulton, 0.9 mile south of; canal bench mark, Oswego Canal; guard Lock No. 3; copper bolt in lower hollow quoin between cinchers	350.95
Fulton, 2.4 miles south of; on south end of stone wall, culvert; marked □ with chisel.....	353.63
Fulton, 4.3 miles south of; canal bench mark, Oswego Canal, Lock No. 7; copper bolt in middle hollow quoin between cinchers	352.49
Fulton, 5.5 miles south of; canal bench mark, Oswego Canal, unused lock; copper bolt in lower hollow quoin.....	358.89
Hinmansville; canal bench mark, Oswego Canal, Lock No. 6; copper bolt in lower hollow quoin between cinchers	359.70
Phoenix; Culvert street; canal bench mark, Oswego Canal; copper bolt in second step of bridge abutment, south end.....	363.91
Phoenix; fire plug in Canal street, 300 feet south of Bridge street.....	371.52
Phoenix; Bridge and Cherry streets; northwest corner of Union Academy; Cherry street front; water table; aluminum tablet, marked "394 OSWGO".....	394.066
Phoenix; canal bench mark, Oswego Canal; copper bolt in second step of abutment, south end, on Bridge street; marked "364 A".....	364.054
Phoenix; canal bench mark, Oswego Canal, Guard Lock No. 1; copper bolt in upper hollow quoin between cinchers; marked "363 A".....	363.458
Baldwinsville; fire plug in corner of East Oneida and Pine streets.....	403.07
Baldwinsville; top of rail of Delaware, Lackawanna and Western Railroad on East Oneida street.....	388.63
Baldwinsville; southeast corner of Free Academy on Elizabeth street; aluminum tablet, marked "423 OSWGO".....	423.438
Baldwinsville, 0.5 mile south of; on cement stepping stone in front of James Kelley's house, on Syracuse street, southeast corner stone.....	384.608
Baldwinsville, 2.1 miles south of, on northwest end; large stone over creek crossing marked □ with chisel	413.60
Baldwinsville, 3.3 miles south of; on bowlder on east side of road 700 feet north of foot of hill; marked □ with chisel.....	467.98
Baldwinsville, 4.3 miles south of; on large bowlder at foot of hill on north side of road; marked □ with chisel	431.69
Baldwinsville, 5 miles south of; on bowlder on south side of road; marked □ with chisel, 900 feet east of turn in road	424.25
Baldwinsville, 6 miles south of; on cement water trough in front of brick house on west side of road at end of cement wall; fence marked with chiseled square	460.65
Warners; 700 feet east of crossroads; Mr. Hawley's brick dwelling; in east end of stone water table; aluminum tablet, marked "477 OSWGO".....	477.423
Newport, at Warners; Erie Canal bench mark; southwest corner of hotel barn, 30 feet north of canal; chisel mark on bowlder	411.82
FULTON TO OSWEGO, VIA GILBERTS MILLS, PALERMO, CLIFFORD, VERMILION, AND SOUTH CRIBA.	
Fulton; northwest, bolt in iron post in north end of towpath fence, corner of South First and Oneida streets.....	438.86
Fulton; on top of fire plug on northwest corner of South Sixth and Utica streets.....	357.77
Fulton, 2.1 miles east of; on large bowlder on north side of road 200 feet east of hill summit and on corner of farm line; marked □ with chisel ..	423.83
Fulton, 4.9 miles east of; on bowlder at foot of hill on south side of road at base of two maple trees; marked □ with chisel.....	432.19
Fulton, 5.1 miles east of; on large bowlder at southwest corner of crossroad, 6 feet from corner of fence; marked □ with chisel.....	463.67

	Feet.
Gilberts Mills, southeast corner of district school No. 5; aluminum tablet, marked "435 OSWGO"	435.054
Gilberts Mills; on northwest bolt of bridge on truss over Fish Creek	394.48
Gilberts Mills, 1 mile east of; on stone post marked "108 N. Y. S. S.;" on summit of hill 80 feet south of road margin	577.73
Gilberts Mills; 1.1 miles east of; on boulder in front of Newell Wallace's house, 15 feet north of stone fence and in line of west margin of house; marked □ with chisel	483.82
Gilberts Mills, 2.5 miles north of; on boulder at west end of culvert in front of stone schoolhouse, marked □ with chisel	426.79
Gilberts Mills, 3.8 miles north of; spike in root of maple tree in front yard of Mrs. A. Ball's house, opposite center of house	472.39
Gilberts Mills, 4.4 miles north of; on boulder on southwest corner of road at end of fence; marked □ with chisel	472.12
Palermo, 300 feet south of post-office at; on boulder at southeast corner of crossroads; marked □ with chisel	462.38
Palermo, 0.5 mile north of; in front of small white house on west side of road; nail in root of locust tree in yard	473.39
Clifford; northwest corner of crossroads on top of stone foundation of store stoop; marked □ with chisel	436.07
Clifford, 1.5 miles north of; on boulder at southeast corner of roads 120 feet south of schoolhouse; marked □ with chisel	455.56
Vermilion; aluminum tablet on southeast corner of Methodist church on Main street; marked "422 OSWGO"	421.509
Clifford, 2.6 miles west of; on boulder on south side of road at base of elm tree; 300 feet west of house on north side; marked □ with chisel ..	450.62
Clifford, 3.1 miles west of; on rock on south side of road 10 feet from fence and 75 feet west of road corner; marked □ with chisel	429.74
Clifford, 4.4 miles west of; on lower drift bolt of large flagstaff in center of crossroads	452.68
Clifford, 5.4 miles west of; on rock on south side of road in front of yellow house, by gateway; 300 feet west of milepost No. 9	459.28
Clifford, 5.9 miles west of; on rock northwest end of small road bridge; 2 feet west of bridge; marked □ with chisel	429.43
Clifford, 7.2 miles west of; on rock in southwest corner of road to south, 5 feet west of margin of road; marked □ with chisel	420.77
South Scriba; aluminum tablet in southeast corner of Ladies' Aid Society Hall on north side of Hall road; marked "400 OSWGO"	400.487
South Scriba, 1.2 miles west of; on rock at northeast corner of tavern on south side of road; marked □ with chisel	462.20
South Scriba, 2.2 miles west of; on rock on north side of road in front of small graveyard; 20 feet south of gate; marked □ with chisel	437.09
Lansing; on northeast corner of water table of brick schoolhouse; marked □ with chisel	417.82
Lansing, 1.3 miles west of; on boulder on south side of road 2 feet from fence and 4 feet west of milepost No. 2; marked □ with chisel	403.54
Oswego; top of west rail of Rome, Watertown and Ogdensburg Railroad crossing on Hall road	321.1
Oswego; on boulder on northeast corner of Hall road and East Tenth street, 8 feet from fence; marked □ with chisel	320.80
FULTON TO PERU, VIA BOWENS CORNERS, LYSANDER, AND PLAINVILLE.	
Oswego Falls; top of fire hydrant 125 feet north of west end of bridge over Oswego River at Upper Falls	370.13
Fulton, 1.9 miles west of; 30 feet east of road to south; south end of west abutment of highway bridge over Lye Creek; chiseled square	370.74

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Fulton, 2.9 miles west of; road to south; bowlder in southwest corner of roads; chiseled square	424. 93
Fulton, 4.5 miles west of; at Bowens Corners; bowlder in southeast corner of roads near fence post; chiseled square	429. 03
Bowens Corners; stone doorstep, south door of brick schoolhouse, district No. 5; aluminum tablet, marked "449 OSWGO"	448. 593
Bowens Corners, 0.5 mile south of; 5 feet east of road, 300 feet north of brick house on east; chiseled square on rock	446. 44
Bowens Corners, 2.4 miles south of; southeast corner of road to east; chiseled square on large bowlder	392. 50
Bowens Corners, 3.4 miles south of; 200 feet south of road corners; south end of west side of culvert; chiseled square	331. 37
Bowens Corners, 4 miles south of, at crossroads known as Bairts Corners; stone in gutter, southeast corner of roads; chiseled square	395. 19
Lysander; large rock in gutter southeast corner of crossroads; chiseled square	414. 61
Lysander, 1 mile south of; large bowlder; east side of road by private driveway to house; 700 feet north of road to west; chiseled square	445. 80
Lysander, 2.8 miles south of, in northeast corner of crossroads; chiseled square	411. 49
Plainville; aluminum tablet in top step of schoolhouse, district No. 5; 300 feet west of four corners at center of town, on north side of road, marked "403 OSWGO"	402. 679
Plainville, 0.9 mile south of; large stone on southeast corner near fence post; cut □ with chisel	472. 75
Plainville, 1.6 miles south of; on large rock in culvert; on northwest corner; cut □ with chisel	397. 17
Plainville, 2.1 miles south of; on second stone step of stairs leading to graveyard on east side of road; marked □ with chisel	401. 21
Plainville, 3 miles south of; on east end of south bridge abutment at State bridge 2 feet below bridge floor; cut □ with chisel	392. 58
Plainville, 3.8 miles south of; on large stone in west end of culvert under road; cut □ with chisel	417. 50
Plainville, 4.4 miles south of; on large rock southwest corner of road to west; cut □ with chisel	424. 96
Plainville, 5.2 miles south of; on rock in west of culvert across road; 800 feet north of New York Central Railroad; cut □ with chisel	393. 22
Plainville, 5.3 miles south of; West Shore Railroad crossing; top of north rail	404. 7
Plainville, 5.4 miles south of; New York Central Railroad crossing; top of north rail	406. 8
Peru; highway bridge over Erie Canal; copper bolt in west end of bottom step, towpath abutment (Erie Canal B. M.)	412. 63

STERLING STATION TO CATO, ALONG LEHIGH VALLEY RAILROAD.

Sterling Station; spike in telegraph pole on east side of station, 60 feet south of south end and 75 feet south of railroad crossing of Rome, Watertown and Ogdensburg Railroad with Lehigh Valley	322. 02
Sterling Station, 0.4 mile southeast of; on east end of masonry foundation of highway bridge over railroad, 5 feet south of track; cut □ with chisel	315. 89
Sterling, 1.6 miles south of; on stone monument used for transit point by railroad; monument 3 feet west of railroad and 1,100 feet north of highway crossing; cut □ with chisel	335. 58
Sterling Station, 2 miles southeast of; highway crossing; top of east rail	351. 0
Sterling, 2.5 miles south of; highway crossing; top of east rail	365. 5

	Feet.
Sterling Station, 2.5 miles south of; large rock 45 feet south of highway crossing; 40 feet west of railroad and at margin of highway running parallel with railroad; cut □ with chisel	363.40
Martville, 2.8 miles south of; Sterling Station; highway crossing by new railroad station; top of east rail	371.5
Martville, 400 feet south of station on west end of south abutment; top step of railroad bridge over creek; cut □ with chisel	369.78
Martville, 0.3 mile south of; spike in railroad telegraph pole No. 3269	364.37
Martville, 1.4 miles south of; highway crossing; top of east rail	382.9
Martville, 1.4 miles south of; on stone carriage step in front of wooden house on southeast corner of road crossing, 55 feet east of railroad; cut □ with chisel	383.90
Martville, 1.8 miles south of; road crossing; top of east rail	399.6
Martville, 1.8 miles south of; on railroad stone monument in northwest angle of road crossing; 2 feet west of track and 15 feet north of road; cut □ with chisel	398.96
Martville, 2.3 miles south of; top of east rail on trestle over small stream ..	411.7
Martville, 2.5 miles south of; top of east rail on trestle over small creek ..	412.0
Martville, 2.6 miles south of; highway crossing; top of east rail	412.6
Martville, 2.6 miles south of; spike foot of railroad crossing; danger sign in southeast angle of crossing	416.05
Martville, 2.7 miles south of; top of east rail on trestle over small stream; 500 feet south of highway crossing	411.9
Martville, 2.9 miles south of; road crossing; top of east rail	413.4
Martville, 2.9 miles south of; stone railroad monument in northwest angle, 3 feet west of rail; cut □ on top with chisel	413.61
Martville, 3.7 miles south of; spike in telegraph pole No. 3161	414.66
Ira; highway crossing 200 feet north of station; top of east rail of main track	418.5
Ira; on boulder 17 feet from center of highway crossing; 12 feet east of switching track in west margin of short road to railroad scales; cut □ on top with chisel	416.55
Ira; 300 feet south of station; spike in telegraph pole No. 3146	418.40
Ira Station; bronze tablet in northeast corner of water table of brick house situated about 700 feet southwest of the station	430.329
Ira, 0.9 mile south of; spike in telegraph pole No. 3118	416.57
Ira, 1.5 miles south of; on railroad stone monument; cut □ on top with chisel	420.68
Ira, 1.8 miles south of; spike in root of large elm tree 25 feet west of track, marked "377" with red paint	419.30
Ira Station, 2.1 miles south of; road crossing; top of east rail	423.1
Ira Station, 2.1 miles south of; on railroad stone transit monument 2 feet west of track and 85 feet south of center of highway; cut □ on top with chisel	422.76
Ira Station, 3 miles south of; road crossing; top of east rail	418.7
Ira Station, 3 miles south of; spike in telegraph pole, No. 3051; 250 feet south of highway crossing	419.20
Cato; highway crossing; 200 feet north of station; top of east rail of main track	417.6
Cato; on large stone forming drain on north side of road 240 feet west of railroad	419.07
Cato; northwest corner of Main and North streets; southeast corner of water table of brick building; aluminum table marked "461 OSWGO" ..	461.422
CATO TO PORT BYRON, VIA CONQUEST.	
Cato, 1.1 miles west of; on large boulder on southeast corner of road to south; cut □ with chisel	434.84

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Cato, 1.4 miles west of; on large stone forming part of drain in southeast corner of crossroads; cut □ with chisel.....	450.49
Cato, 2.3 miles west of; on large bowlder on margin of road in southwest angle; cut □ on top with chisel.....	432.85
Cato, 2.7 miles west of; on large bowlder near fence post in northeast corner of road to north; cut □ on top with chisel.....	478.10
Cato, 3.8 miles west of; on flat bowlder flush with ground on southwest corner of crossroads; schoolhouse on same corner; cut □ on top with chisel.....	412.28
Conquest, 2.2 miles north of; on large bowlder in west end of road culvert for small stream, at foot of high hill on south; cut □ on top with chisel.....	412.75
Conquest, 1.2 miles north of; on large bowlder 30 feet east of center of highway; 600 feet north of road to east near foot of small butternut tree; cut □ on top with chisel.....	442.05
Conquest, 0.7 mile north of; on large bowlder in northwest corner of road to west; cut □ on top with chisel.....	427.77
Conquest; on large bowlder in north and south road and 25 feet from the northwest corner at foot of maple tree; cut □ on top with chisel.....	440.65
Conquest, 0.6 mile south of; in front of brick house on south side, in water table; house on east side of road; bronze tablet marked "449 A".....	448.845
Conquest, 1.4 miles south of; on large flat stone forming drain on east side of road and on north side of private road to east; cut □ with chisel....	427.84
Conquest, 1.9 miles south of; on large bowlder by fence corner; northeast angle of road to east; cut □ with chisel.....	420.14
Conquest, 2.9 miles south of; on west end of second pier of bridge from Mosquito Point over Seneca River; cut □ with chisel.....	381.68
Conquest, 3.7 miles south of; on large stone flush with ground, 20 feet east of center of highway and 30 feet north of private road to house on east; cut □ with chisel.....	383.69
Conquest, 4.3 miles south of; large bowlder on southwest corner of crossroads; schoolhouse on same corner; cut □ on top with chisel.....	386.80
Conquest, 4.9 miles south of; top of north rail of New York Central and Hudson River Railroad.....	397.29
Conquest, 5 miles south of; on large bowlder in northeast corner of road on east; cut □ on top with chisel.....	422.98
Conquest, 5.5 miles south of; on large stone in middle of group of stones on northwest corner of road to west.....	412.47
Port Byron; top of north rail of West Shore Railroad.....	395.0
Port Byron; Canal street highway bridge over Erie Canal; copper bolt, east wing, towpath abutment.....	404.82
Port Byron; highway bridge just east of Canal street; copper bolt, east wing, towpath abutment.....	405.73
Port Byron, Lock No. 52; fourth step from the west end north side of lock pier; copper bolt.....	401.47
Port Byron, Lock No. 52; east hollow quoin south side of lock; lead bolt; marked "404 A".....	404.20

ESSEX, WARREN, HAMILTON, FULTON, MONTGOMERY, HERKIMER,
ONEIDA, AND LEWIS COUNTIES.

FONDA, GLOVERSVILLE, FAYVILLE, SPECULATOR, INDIAN LAKE, THIRTEENTH LAKE,
NORTH CREEK, NEWCOMB, BLUE MOUNTAIN LAKE, REMSEN, WILMURT, M'KEEVER,
OLD FORGE, CANADA LAKE, LITTLE FALLS, AND UTICA QUADRANGLES.

The elevations published in the Appendix of the Eighteenth Annual Report, page 239 and following, are all raised by varying quantities as

a result of the connection in circuit form and reduction made because of levels run in the field season of 1898. The levels of this season were brought northward from the bench marks of the United States Engineer Corps at Utica and Little Falls, and connected through the Canada Lakes and Old Forge quadrangles with the elevations brought northward in 1896 from the United States Engineer Corps bench mark at Fonda.

The elevations published in the Appendix to the Eighteenth Annual Report, pages 239 to 242, the line from Auriesville and Fonda to Speculator, have been corrected by varying amounts as a result of this recent adjustment, and are therefore republished herewith.

All elevations heretofore published in the Appendix to the Eighteenth Annual Report, pages 242 to 257, inclusive, are to be raised or increased by the constant amount 0.306 foot, this being the amount of the change in the Speculator bench mark which was set in 1896.

All elevations published in the Appendix to the Eighteenth Annual Report, pages 258 to 263, inclusive, are corrected by varying amounts as a result of the adjustment of this year, and are therefore republished herewith.

The leveling done during the field season of 1898 was executed under the general direction of Mr. A. M. Walker, topographer, by Messrs. C. H. Semper and W. W. Gilbert, levelmen.

All bench marks set in the course of this work are marked with the letter "A" in addition to the figures of elevation, thus referring them to the Gristmill bench mark at Albany through the precise level line of the United States Engineer Corps.

Utica quadrangle (republished and amended).

UTICA.		Feet.
Whitesboro and Genesee streets, southwest corner; top of westerly cap bolt on hydrant.....		414.96
Delaware, Lackawanna and Western Railroad station; top of doorsill, southeast corner of corner door.....		408.76
North Genesee street, No. 218; water table, southwest corner of brick building.....		409.59
Post-office; bronze tablet west of east basement door, rear of building, marked "U. S. Geological Survey B. M. Elevation 419 feet".....		416.788
Webster avenue and Albany street; top of most southerly cap bolt on hydrant.....		494.75
Albany and Elizabeth streets; top of southerly cap bolt of hydrant.....		462.06
Albany and Bacon streets; top of most southerly cap bolt of hydrant....		545.48
Albany street and Tilden avenue; top of hydrant (city bench mark, 548.03)		547.67
Albany street and Welsh Bush road; electric-light tower, top of second step from bottom.....		524.94
Albany street, Starch Factory Creek; stone arch bridge, north abutment, west wing, on northeast corner of top step.....		522.65
Delaware, Lackawanna and Western, and Rome, Watertown and Ogdensburg railroads; northwest corner of foundation of northwest pier (New York Central and Hudson River Railroad elevation, 406.964).....		408.37

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
New York Central and Hudson River Railroad bridge No. 501, at Starch Factory Creek; south end of coping, west abutment (railroad elevation, 404.477)	405.92
North Genesee street; top of south end of west rail, Deerfield street-car track	409.5

UTICA, VIA ALBANY PLANK ROAD, TO FRANKFORT HILL AND STEWARTS CORNERS.

Albany plank road, Herkimer and Oneida county-line monument, marked on north side "1889," on east side "H," and on west side "O," the south side being blank; arrow and drill hole on top	694.43
Albany plank road, James McLaughlin's house; top of hitching post in front of	824.20
Albany plank road, road forks east and southeast; highest point on capstone at west side of upper end of culvert	885.84
Albany plank road, on road southeast; nail in wild-apple tree 75 feet south of culvert	888.89
Albany plank road, Joseph Cooper's house (occupied by Mr. Easterman); nail in east side of wild-cherry tree on east side of road, north of house, near fence	991.95
Albany plank road, crossing of Marsh road; highest point on southeast corner of capstone of culvert northeast from schoolhouse	983.35
Albany plank road, road west; nail in root of black-ash tree, below blaze with three hacks, east side of road	1,288.15
Frankfort Hill post-office; southeast corner of piazza, opposite road east ..	1,331.36
Stewarts Corners, church; northwest corner of top step at front entrance, 2 inches from building	1,350.77

STEWARTS CORNERS, VIA MOYER CREEK, TO FRANKFORT.

Rushmer road; copper bolt in bowlder east of first barn east of Stewarts Corners, between third and fourth telegraph poles east of barn, Nos. 9588 and 9587. Bowlder lies half in road and half in field, and copper bolt is marked "U.S.G.S. 1,380 feet. B.M."	1,378.174
Rushmer road; cross mark chiseled in corner stone of stone fence, westernmost corner of road coming in from the south	1,267.75
Rushmer road, northeast corner of road to north; nail in root of large hard-maple tree	1,182.14
Brick schoolhouse, district No. 8; square chisel mark northwest corner of doorsill	1,091.81
Moyer Creek road, John Bouck's house, 600 feet east of; square chisel mark and letters "B.M." on bowlder on north side of driveway of road	1,069.17
Moyer Creek Gulf road; square chisel mark on top of bowlder with "M" chiseled on south side, near east side of road on side hill, near two small blazed butternuts and 50 feet north of large blazed butternut with three hacks	997.22
Moyer Creek Gulf road; bent nail east end of south sleeper of highway bridge north of road forks	908.50
Moyer Creek Gulf road, Charles Denslow's house; nail in root of blazed and hacked elm tree opposite	855.53
Moyer Creek Gulf road, intersection of road west; square chisel mark on south abutment of bridge, west wing	633.75
Moyer Creek wooden bridge; nail in root of blazed butternut tree, east side of road near old barn and abandoned house, 200 feet north of bridge ..	577.98
Moyer Creek iron bridge; square chisel mark on coping of bridge seat, north abutment, east wing	499.96
Frankfort, N. Y.; square chisel mark southeast corner of limestone carriage step in front of house on Litchfield street opposite Fourth avenue	432.30

DEERFIELD, VIA TRENTON PLANK ROAD TO SOUTH TRENTON.

	Feet.
Deerfield, J. A. Auerte's brick building, middle door; north corner of stone doorsill	427.16
Trenton plank road; top of stone south of culvert, at intersection of Walker road, 10.2 feet south of telephone pole	431.06
Trenton plank road; nail southwest side of telephone pole at intersection of Walker road, 102 feet north of above stone	431.49
Trenton plank road; willow tree east side of road and 180 feet from foot of hill, blazed with three hacks, nail in notch 1 foot above ground.	461.60
Trenton plank road; blazed telephone pole on top of rise, east side of road and south from drab-colored house, top of nail	530.57
Trenton Falls plank road, at intersection of road running north; top of nail in notch cut in blazed willow tree; two other willows just west of bench mark	616.84
Trenton plank road, opposite intersection of Glass Factory or Holland Patent road; nail in top of chopped down, blazed, and marked telephone pole, 1.5 feet south of blazed and marked telephone pole	707.18
Trenton plank road, intersection of Church road; square chisel mark on stone at south corner 2 feet east of blazed and marked corner fence post.	809.17
Trenton plank road, Salem Welsh Church on road west 600 feet from plank road; square chisel mark on foundation stone at southeast corner	815.28
Trenton plank road, square chisel mark on stone over fence, back of telephone pole with bulletin board, opposite road to northwest	853.09
Trenton plank road, square chisel mark, southwest corner of capstone, south side of culvert over little brook at head of gully	1,018.46
Trenton plank road, road crossing; square chisel mark on boulder in northwest corner, 3 feet east of blazed and marked corner fence post.	1,211.20
Trenton plank road, square chisel mark on boulder east side of road, 350 feet north of edge of woods and 250 feet south of first culvert in woods.	1,161.96
Trenton plank road, opposite road to northeast; square chisel mark on boulder west side of road	1,079.48
Trenton plank road, 500 feet south of T. H. Williams's, west side of road; square chisel mark on boulder north of small iron bridge and opposite farm road to northeast	1,000.45
Forest House; square chisel mark on boulder north of barn, opposite hotel.	934.24
Trenton plank road, west side of road along telephone line; square chisel mark on boulder opposite road from Forest House	900.09
Trenton plank road, Budwin Jones's house; top of limestone hitching post in front of	839.48
Trenton plank road, Ninemile Creek bridge; square chisel mark on west bridge seat, north abutment	755.40
Trenton plank road, South Trenton Church, opposite schoolhouse, southeast corner of carriage step; square chisel mark	806.66
Trenton plank road, South Trenton Cemetery; bent nail in root south side of beech tree opposite middle gate	803.18
South Trenton; copper bolt in boulder north side of road opposite west gate of cemetery, marked "U.S.G.S. B.M. 806 ft."	803.519

SOUTH TRENTON TO NORTH GAGE.

North Gage road, square chisel mark on stone north side of road, opposite road running south	822.63
North Gage road, intersection of South Trenton road, northwest corner of road crossing; square chisel mark on boulder	900.89
North Gage road, road north (almost abandoned); square chisel mark on boulder inside of fence, northeast corner	971.31

TRIANGULATION AND SPIRIT LEVELING.

347

	Feet.
North Gage, M. M. Schermerhorn's house; top of easterly limestone hitching post	965. 42
North Gage Church; square chisel mark on southeast corner of stone step	985. 56

NORTH GAGE TO POLAND.

North Gage, east of first road running north; bent nail in root of hard-maple tree in southwest corner of road crossing	944. 96
North Gage road, road north to Poland at cheese factory; square chisel mark on stone in northeast corner	914. 92
Hill road, intersection with Valley road, 300 feet east of covered wooden bridge over West Canada Creek, 1½ miles above Poland; nail in root of apple tree in southwest corner of road crossing	719. 34
West Canada Creek bridge, 1½ miles above Poland; square chisel mark on south abutment bridge seat, east wing of bridge	706. 24
West Canada Creek, iron bridge, ¼ mile west of Poland; square chisel mark on west abutment, north wing	697. 41
Poland, Main street; square chisel mark on west coping, center of stone arch over Cold Brook	719. 92
Poland Free Baptist Church; stepping stone, square chisel mark in southeast corner	715. 33
Poland, railroad station; spike in telegraph pole opposite. (This is R. R. B. M. Elevation above sea, as given by R. R., is 706.752=703.849 N. Y. C. & H. R. R. R.)	707. 08

POLAND TO NEWPORT.

Poland, ¼ mile south of; square chisel mark on east abutment bridge seat, north wing iron bridge (highway) over West Canada Creek	690. 39
Square chisel mark on bridge seat, south abutment, east wing of bridge over small brook, north of and near forks to hill road running southeast.	682. 80
Square chisel mark on stone east side of road south of house (old glue factory) owned by Milo Morey; fence post blazed	682. 17
Newport, Main and Norway streets, top of snubbing stone in northeast corner of crossing, square chisel mark	680. 72
Newport National Bank, water table northeast corner of building	657. 07
Newport, stone bridge over West Canada Creek; square chisel mark on north coping over center pier	655. 92
Newport, copper plug set in north coping over center pier of stone bridge over West Canada Creek, 6 inches south of square chisel mark and flush with coping, marked "U.S.G.S. 658 ft. B. M."	655. 92

ILION.

Steel Creek Aqueduct, Erie Canal; copper bolt in center of third coping stone from west end, parapet wall, towpath side, marked "U. S. G. S. B. M. 410 Ft."	408. 228
West Canal street, west end; top of cap, east nozzle of hydrant	402. 59
East Main street; top of cap, east nozzle of first hydrant east of East street, in front of greenhouse	409. 32

FRANKFORT TO COPPER PLUG NORTH OF FRANKFORT, IN TOWN OF SCHUYLER.

Frankfort; most northerly cap bolt on four-nozzle hydrant in front of Central Hotel	414. 12
West Shore Railroad crossing; top of south rail	400. 11
Mohawk River bridge, near Frankfort station; square chisel mark on bridge seat, north abutment, east wing	398. 30
New York Central Railroad crossing; top of south rail	399. 69

	Feet.
Nail in root, northeast side of second maple tree on south side of road and west of road from north with B. & B. telephone line	410. 29
Snubbing stone southeast corner of road at crossing of road running south with B. & B. telephone line, square chisel mark	409. 31
Square chisel mark on stone back of corner fence post opposite road to East Schuyler church	418. 11
Nail on top of corner fence post in northwest corner of road north	409. 46
Square chisel mark on south side of millstone used as carriage step in front of white house opposite road from south	474. 33
United States Geological Survey iron bench-mark post at southwest corner of road crossing road forks, marked "U.S.G.S. B. M. 530 ft."	577. 527

Little Falls quadrangle (in part republished and amended).

LITTLE FALLS TO SALISBURY CENTER, VIA DOLGEVILLE.

Little Falls, engineer's bench mark at Lock No. 36, Erie Canal	342. 882
Little Falls, southeast corner of Ann and Albany streets, northwest corner of brick building with stone foundation; aluminum tablet marked "397"	396. 513
Little Falls, 2 miles east of; Erie Canal Lock No. 37; northeast corner top coping stone, marked +	352. 93
Little Falls, 2½ miles northeast of, at small stream running south; top of iron pin, northwest corner of wooden trestle	494. 88
Manheim; top of south rail opposite station	603. 9
Inghams Mills, 27 feet east of Little Falls and Dolgeville Railroad track, 120 feet north of road crossing; rock in place, 6 feet above ground; aluminum tablet, marked "726 A"	726. 265
Inghams Mills, 1 mile north of, at high trestle over Gillett Creek; iron pin, northwest corner of trestle	786. 38
Dolgeville, Main street crossing; top of railroad spike in northeast corner of cattle guard	852. 92
Salisbury Center, Universalist church; stone opposite	1, 068. 79

SALISBURY CENTER TO MIDDLEVILLE, VIA FAIRFIELD.

Salisbury Center, Universalist church; brick work in rear church; aluminum tablet, marked "1065 A"	1, 063. 772
Salisbury Center, 1 mile west of, and 50 feet west of Spruce Creek bridge; maple tree by south road fence; notch on root	1, 071. 04
Salisbury Corners; church near northeast corner of crossroads; stone entrance, lower step; south end of face corner, chiseled square	1, 213. 62
Salisbury Corners, 1 mile west of, at crossroads known as Bevills Corners; boulder 4 feet broad on south side of shop northeast corner of roads; chiseled square	1, 380. 38
Fairfield, 1½ miles east of, at crossroads; schoolhouse northwest corner of road; north end of doorsill	1, 493. 56
Fairfield, Military Academy, laboratory building; front of south end in stonework 3 feet above ground; aluminum tablet, marked "1278 A"	1, 277. 267
Fairfield, Military Academy, laboratory building; front, south end; projection on corner stone 1 foot above ground; old bench mark marked "1276.829" above tide at Troy	1, 275. 640
Middleville, 1½ miles east of; stone bridge over stream; south parapet, east end, northeast corner	859. 15

FROM MIDDLEVILLE TO POINT ON JERSEYFIELD LAKE ROAD 5½ MILES NORTH OF SALISBURY CENTER, VIA NORWAY AND MEXICO.

Middleville, 2½ miles north of, opposite road to west; elm tree 3 feet in diameter, 25 feet southwest of fork; notch on root	652. 09
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	Feet.
Middleville, 3½ miles north of, 200 feet north of road to east, by stone schoolhouse; east end of stone culvert, chiseled square.....	776.40
Norway, 2½ miles west of, and 150 feet north of White Creek bridge; bowlder, 4 feet broad, by west road fence; chiseled square.....	860.63
Norway, 1½ miles west of, 100 feet east of house on north side of road; elm tree, 2½ feet in diameter, by north road fence; point, notch on root.	1,059.69
Norway, northwest corner of crossroads, opposite hotel; west end of stone foundation of building, 1 foot from face corner; aluminum tablet, marked "1320 A".....	1,319.230
Norway, 1½ miles east of, and 100 feet east of crossroads; bowlder, 8 feet broad, 15 feet south of road; chiseled square.....	1,681.22
Norway, 2½ miles east of; 75 feet west of road to south; bowlder, 8 feet broad, 10 feet north of road; highest point.....	1,743.04
Norway, 4 miles east of, at east end of east and west road; southwest corner of; bowlder, 4 feet broad, 6 feet from fence corner; chiseled square.....	1,464.49
Norway, 5 miles east of, at fork of road to east and southeast; bowlder, 6 feet broad, in fork; chiseled square.....	1,480.49
Mexico, 200 feet west of Spruce Creek bridge; old cellar; prominent stone at northwest corner of wall; highest point.....	1,379.02
Mexico, 1 mile east of; old schoolhouse at angle of road; bowlder, 6 feet broad, 5 feet from southwest corner; chiseled square.....	1,470.26
Salisbury Center, 5½ miles north of, on Jerseyfield Lake road and 80 feet north of road, in outcrop 1 foot from southeast corner of Willis Nichols's barn; aluminum tablet, marked "1618 A".....	1,617.935
Salisbury Center, 5 miles north of, 1 mile north of Johnsons Mills, at summit opposite road west to Norway; bowlder 20 feet north of road corner; chiseled square.....	1,519.64

TO SALISBURY CENTER, VIA JERSEYFIELD LAKE ROAD.

Salisbury Center, 4 3 miles north of; bowlder east side of road and opposite blazed beech tree west side of road; chiseled circle.....	1,537.28
Salisbury Center, 3.2 miles north of; bowlder, 10 feet east of road, 125 feet south of barn on east of road; chiseled circle.....	1,454.06
Salisbury, 2.3 miles north of, at Curtis schoolhouse, east and west road crossing; stone step, marked with circle.....	1,425.48
Salisbury Center, 1.2 miles north of; circle on stone in corner of road leading west.....	1,291.76
Salisbury Center, ¼ mile north of, at corner of road leading to Devereaux; circle on rock.....	1,152.70

NEWPORT TO MOHAWK, VIA MIDDLEVILLE AND HERKIMER.

White Creek iron bridge; square chisel mark on south abutment bridge seat, east wing.....	632.24
City Brook; square chisel mark on coping stone on south end of east parapet wall of stone arch.....	608.50
Square chisel mark on sandstone bowlder on west side of road and north of barn at intersection of Creek road and road from north, opposite A. G. Smith's house.....	607.44
Canon Brook, stone arch over; square chisel mark on coping stone, south end of east parapet wall.....	590.73
Middleville, Main and Bridge streets; square chisel mark on northwest corner of stone porch of H. E. & D. G. Jackson's store.....	583.39
Middleville, West Canada Creek; north coping of west abutment of iron bridge, marked "⊙ B.M. 21.".....	571.75

	Feet.
Middleville, West Canada Creek; copper bolt in coping of iron bridge, west abutment, north wing, marked "U.S.G.S.B.M. 572."	570.261
Middleville; head of spike in third telegraph pole north of bridge across mill race at dam on west side of creek	573.84
Middleville, one mile south of; square chisel mark on capstone of culvert on west side of road, south of road west	551.95
Herkimer County Poorhouse; square chisel mark in north corner of bottom flagstone, front entrance	590.61
Countryman's station, $\frac{1}{4}$ mile north of; square chisel mark on capstone of culvert on west side of road, south of road west	549.17
Countryman's station, Atlantic and St. Lawrence (Grand Trunk) Railroad, bridge No. 10; square chisel mark on coping stone of north abutment, west wing wall, close to angle	491.71
West Canada Creek, Dempster's Bridge, $\frac{1}{4}$ mile north of Kast's Bridge; bridge seat, north abutment, west wing, marked "⊙ B.M."	473.20
West Canada Creek, Kast's Bridge (railroad station); bridge seat, west abutment, north wing, marked "⊙ B.M."	456.91
Kast's Bridge, $\frac{1}{4}$ mile south of; square chisel mark on stone west of intersection of Creek road with road running northwest up steep hill	452.94
Herkimer, German; and Lake streets; square chisel mark on stone projecting out of wall, west abutment, south wing of flood bridge	401.78
Herkimer waterworks, pump house; northwest corner of doorstep, north door, marked "⊙ B.M. 5"	401.44
Herkimer, Albany and Washington streets; top of corner fence post in southwest corner	400.57
Herkimer, Court street, county clerk's office; left of main entrance, aluminum tablet, set in stone water table, marked "407 A"	406.382
Herkimer, Albany and Main streets; water table southeast corner of Manion and Fick's Building	394.48
Mohawk, closing bench on circuit Utica, South Trenton, North Gage, Poland, Newport, Middleville, Herkimer, and Mohawk; Erie Canal Lock No. 42, coping at end of anchor, northeast gate, north lock, marked "⊕ B.M."	396.683

Remsen and Wilmurt quadrangles (in part republished and amended).

TRENTON, VIA PROSPECT, HINCKLEY, AND NORTHWOOD, TO NEAR WILMURT, AND THENCE VIA OHIO TO COLD BROOK.

South Trenton, $\frac{1}{4}$ mile north of; chiseled square on boulder, west side of road 20 feet south of large elm tree	826.10
Trenton, 0.78 mile south of; chiseled square on stone step in front of porch of new house at southwest corner of intersection of roads	795.16
Trenton, Rome, Watertown and Ogdensburg Railroad station; water table 0.42 foot west of door jamb, south door of waiting room	840.23
Trenton, 0.7 mile north of station; top of iron bolt in top of northernmost of two stone hitching posts 25 feet apart on west side of road and opposite road turning east	797.20
Trenton, 1.1 miles north of station; iron bolt in top of easternmost of two stone hitching posts 50 feet apart north side of street on road to Prospect	779.77
Trenton, 2 miles north of station; chiseled square on east end of stone wall in front of white house on north side of road	869.76
Prospect station, Rome, Watertown and Ogdensburg Railroad crossing over highway just north of; chiseled square on lower step of south abutment, east side	984.51

	Feet.
Prospect station, Rome, Watertown and Ogdensburg Railroad, 0.4 mile north of; chiseled square on granite boulder north side of road 340 feet east of Mohawk and Malone Railroad crossing	1,085.93
Prospect, iron bolt in top of stone hitching post in front of post-office opposite street going east to Hinckley	1,187.63
Prospect post-office, 0.22 mile north of; copper bolt in large boulder 3 feet high, 12 feet long, and 7 feet wide, in field opposite creamery and east of road; bolt is marked "1142 R."	1,140.686
Prospect, 0.4 mile east of; chiseled square on boulder north side of road 22 feet from corner of red-painted building (pump factory)	1,209.46
Prospect, 1.3 miles east of; chiseled square on lower step, in line of stone wall in front of white house on north side of road	1,215.37
Hinckley, $\frac{1}{2}$ mile west of Empire Hotel; chiseled square on east end of wall of stone culvert north side of road	1,180.62
Hinckley, 0.6 mile east of Empire Hotel; chiseled square on small boulder deeply embedded in ground west side of road close to wagon track	1,193.60
Hinckley, State bench mark west of road painted "B.M. No.63"	1,182.47
Hinckley, 2.3 miles northeast of and about 1.1 miles west of Oneida-Herkimer County line, in Remsen Township; copper bolt in boulder west side of road in pasture, 55 feet from road center, marked "1262 R." ..	1,261.208
Hinckley, 3.4 miles northeast of; nail in root of elm tree beside double maple tree on line of wire fence south side of road, about 290 feet west of Oneida-Herkimer county line	1,247.77
Northwood; chiseled square on stone abutment at northwest corner of iron bridge over stream at sawmill	1,207.04
Northwood, 0.6 mile east of; chiseled square on boulder on south side of road opposite road from the north and in front of an old abandoned schoolhouse	1,228.07
Northwood, 2.2 miles east of; chiseled square on boulder north side of road 150 feet east of old abandoned house	1,249.22
Northwood, 2.8 miles east of; copper bolt in large boulder 7 feet north of center of road and 3,450 feet west of abandoned house south of road, marked "1258 R."	1,257.240
Northwood, 3.7 miles east of; chiseled square on large boulder sticking out of bank left side of road going south and fording West Canada Creek	1,238.88
Northwood, 4.8 miles east of; chiseled square on large flat boulder 15 feet north of center of road near wire fence	1,264.07
Northwood, 5.2 miles east of; chiseled point, painted black, and marked "H'" on a large boulder 125 feet north of road and 100 feet west of small house. This is a State bench mark	1,288.62
Hubbard's Hotel, 0.18 mile east of; State bench mark, on boulder in meadow about 60 feet south of road and 25 feet east of a fence; chiseled point, painted and marked "E'"	1,275.85
Ohio, 3.3 miles north of; chiseled circle on large boulder 5 feet west of center of road	1,306.71
Ohio, 2.4 miles north of; chiseled square on boulder on west side of road in front of a blue house at bend in road to east	1,326.07
Ohio, 1.7 miles north of; nail in root of large maple tree 75 feet east of road near junction with road northwest and southeast	1,395.44
Ohio, 750 feet west of corner near church, 1,200 feet east of schoolhouse and 80 feet north of road, in field belonging to G. Johnson; copper bolt, marked "1374 R."	1,373.369
Ohio, private burial ground opposite schoolhouse; top of footstone of grave marked "D. B.," near Boyce monument	1,376.82

	Feet.
Ohio, 1.1 miles south of; chiseled square on large round bowlder west of road, 225 feet north of bridge across small stream	1, 261.41
Ohio, 2.6 miles southwest of; chiseled square on stone foundation at northeast corner of iron bridge over Black Creek	1, 235.68
Cold Brook, 3.4 miles north of, and 3.6 miles south of Ohio; copper bolt in bowlder 3 feet outside of wire fence on west side of road, 480 feet south of road from west and 1 mile south of crossing of Black Creek in Prussia Township; bolt is marked "1265 R."	1, 284.24
Cold Brook, 3.1 miles northeast of; chiseled square in small bowlder 2 feet north of fence in field on north side of road about 125 feet west of wood-colored house on the north	1, 401.14
Cold Brook, 2.4 miles northeast of; chiseled square on small bowlder in sand about 6 feet west of west branch of road which follows bottom of ravine	1, 271.02
Cold Brook, 1.7 miles northeast of; chiseled square on bowlder at southwest corner of red bridge across Cold Brook, near cheese factory	1, 056.603
Cold Brook, 1.3 miles northeast of; chiseled circle in bowlder 6 inches above ground in front of yellow house on west side of road	1, 003.47
Cold Brook, 0.7 mile northeast of; top of iron ring in stone hitching post, northwest side of road opposite blacksmith shop	927.92

COLD BROOK TO POLAND.

Poland, first iron bridge over Cold Brook northeast of village; foundation stone, east abutment, north wing; copper plug, marked "U.S.G.S. B.M. 800 Ft."	798.371
Poland, Charles Buck's house, opposite road to village of Cold Brook; southeast corner of piazza	786.72

FROM NEAR WILMURT, VIA NOBLEBORO, TO HONNEDAGA LAKE.

Mad Tom Creek, wooden truss bridge over; chiseled square on small bowlder 4 feet from northeast corner of bridge	1, 296.47
Wilmurt, 0.7 mile west of and 165 feet east of Henry Paull's hotel; top of bronze tablet in large bowlder 70 feet south of center of road, in pasture, marked "1402 Ft. R."	1, 400.769
Wilmurt, chiseled square on bowlder in angle at three corners opposite post-office; iron bridge across West Canada Creek	1, 392.98
Wilmurt, 0.8 mile northeast of; State bench mark on large bowlder in meadow 250 feet south of road; chiseled point, painted black, marked "W"	1, 384.54
Wilmurt, 1.9 miles northeast of; nail in blazed root of large maple tree north side of road	1, 436.64
Nobleboro, 225 feet east of hotel; chiseled square on small bowlder 4 feet from fence on north side of road	1, 418.16
Nobleboro, 0.4 mile north of; State bench mark No. 2 on small bowlder at top of hill north side of road; chiseled point, painted black	1, 511.43
Nobleboro, 0.6 mile north of; State bench mark No. 3 on bowlder 6 feet east of road and 40 feet south of small wooden bridge; chiseled point, painted black	1, 520.85
Nobleboro, 1 mile north of; State bench mark No. 4, on bowlder beside maple tree south side of road, 100 feet west of house on same side of road; chiseled point, painted black	1, 542.45
Nobleboro, 1.5 miles north of; State bench mark No. 6, on bowlder west of road and 40 feet west of small wooden bridge; chiseled point, painted black	1, 511.91

	Feet.
Nobleboro, 2.4 miles north of; State bench mark No. 9, on large bowlder 8 feet south of center of road and 225 feet west of Haskell Hotel; chiseled point and painted black	1, 573. 67
Nobleboro, 2.64 miles north of; State bench mark No. 10, on bowlder about 4 feet to right of road, chiseled point and painted black	1, 590. 91
Nobleboro, 3.06 miles north of; State bench mark No. 11, on large flat ledge at left of roadway, chiseled point, painted black	1, 598. 31
Nobleboro, 3.51 miles north of; chiseled circle on large flat bowlder in old gravel pit on right of road; elevation in black paint	1, 684. 43
Nobleboro, 3.97 miles north of; chiseled point marked with black paint on bowlder west of road	1, 793. 29
Nobleboro, 4.77 miles north of; nail in beech stump, marked with black paint, 2 feet east of wagon track	1, 973. 06
Nobleboro, 5.27 miles north of; large granite bowlder 10 feet east of center of road and 150 feet east of small stream in deep ravine or gulch; chiseled circle and black paint mark	1, 883. 58
Nobleboro, 5.85 miles north of; chiseled square and black paint mark on bowlder about 4 feet west of center of road	1, 976. 75
Nobleboro, 6.57 miles north of; bowlder 7 feet east of center of road in upper end of gravel pit, chiseled circle and black paint	2, 236. 12
Nobleboro, 7.31 miles north of; chiseled square and black paint mark on large flat bowlder in old gravel pit on west of road, top of hill	2, 506. 69
Nobleboro, 7.89 miles north of; chiseled circle and black paint mark on bowlder 25 feet left of road and about 50 feet north of old gravel pit partly filled with water	2, 492. 91
Honnedaga Lake, 2.68 miles south of; chiseled square and black paint mark on bowlder 9 feet east of center of road	2, 523. 52
Honnedaga Lake, 2.12 miles south of; chiseled square and black paint mark 6 feet west of center of road and 500 feet south of long bridge	2, 290. 15
Honnedaga Lake, 1.58 miles south of; chiseled square and black paint mark on small round bowlder 20 feet east of road	2, 254. 01
Honnedaga Lake, 1.35 miles south of; chiseled square and black paint mark on large bowlder 10 feet east of road	2, 242. 42
Honnedaga Lake, 1.04 miles south of; chiseled square and red keel mark on large bowlder 5 feet east of center of road	2, 205. 15
Honnedaga Lake, Herkimer Landing; copper bolt in very large bowlder, about 35 feet southwesterly from corner of barn, and about 325 feet from lake, marked "2223 Ft. R."	2, 222. 088

NOBLEBORO TO MOREHOUSEVILLE.

Nobleboro, 0.7 mile east of; chiseled square on large bowlder 8 feet south of center of road	1, 521. 52
Nobleboro, 1.5 miles east of; State bench mark on bowlder 15 feet north of road near small maple tree and about 150 feet east of road coming in from south; marked with black paint and "P"	1, 600. 80
Nobleboro, 2.5 miles east of; chiseled square on large bowlder 7 feet south of center of road and 400 feet west of house on south side of road	1, 636. 57
Nobleboro, 3.3 miles east of; chiseled square on bowlder 15 feet south of road, $\frac{1}{4}$ mile east of cheese factory	1, 689. 30
Nobleboro, 3.9 miles south of; chiseled circle on bowlder on lowest side of road 25 feet east of road coming in from southwest	1, 774. 31
Nobleboro, 4.4 miles east of; chiseled square on bowlder 15 feet left of road	1, 807. 87
Morehouseville; copper bolt in flat ledge 15 feet south of center of road to Piseco Lake, 425 feet east of schoolhouse, and 940 feet east of road south at post-office, marked "1909 Ft. B.M."	1, 909. 580

PROSPECT TO WHITE LAKE, VIA REMSEN AND FORESTPORT.

	Feet.
Prospect, 1,150 feet north of post-office; copper bolt in large bowlder in field opposite creamery and marked "U.S.G.S. 1142 Ft. B.M.".....	1, 140.686
Prospect, 1,000 feet northeast of depot, on Hinckley Branch Railway; northwest corner of coping of parapet north side of culvert marked "O BM 55" with chisel.....	1, 146.41
Remsen, north end of retaining wall between lower milldam and Rome, Watertown and Ogdensburg Railroad; cross mark on bronze tablet set in end of coping near face corner marked "1172".....	1, 170.045
Remsen, 1 mile north of, at Adirondack and St. Lawrence Railway bridge; chiseled square on south abutment, west end parapet.....	1, 203.53
Remsen, 2½ miles north of; bowlder 20 feet east of track, 10 feet north of farm road crossing, and 750 feet south of public road crossing, marked with chiseled square.....	1, 217.69
Honnedaga station, ¼ mile north of, 40 feet west of track opposite cattle guard; copper bolt, in bowlder 15 feet wide and 6 feet high, marked "U.S.G.S. R 1209 Ft. R B.M.".....	1, 207.860
Honnedaga station, ¼ mile north of; top step, northwest wing of cattle guard, chiseled square.....	1, 211.82
Forestport station, 2 miles south of; north end of Black River (Reservoir) bridge, chiseled square on west end of coping of parapet.....	1, 178.41
Forestport station, 100 feet west of, on road to village and 30 feet south of road; black cherry tree, 2 feet in diameter; nail in notched root west side tree.....	1, 198.36
Forestport station, 0.3 mile north of; north end of railroad bridge over Little Woodhull Creek, west end of parapet coping, copper bolt marked "U.S.G.S. R 1199 Ft. B.M.".....	1, 198.485
Forestport, 2½ miles north of, at Anos siding; notch on root of poplar tree 6 inches in diameter, 50 feet east of track.....	1, 299.17
Forestport, 2½ miles north of; cattle pass ¼ mile north of road crossing, chiseled square on top step, northeast corner.....	1, 301.56
White Lake station, 2 miles south of, near Nichols Mills; chiseled square on face of coping at northwest corner Bear Creek railroad bridge.....	1, 369.51
White Lake station, 50 feet west of railroad track, 10 feet north of wagon road; copper bolt, in bowlder 5 feet broad, marked "U.S.G.S. R 1421 Ft. B.M.".....	1, 420.095

FORESTPORT TO NORTH LAKE VIA ENOS.

Weeds Mill schoolhouse, 60 feet northeast of, west of small road running south from main road; outcrop 3 by 5 feet and 1½ feet above ground....	1, 245.
Black River bridge, south side of west abutment; square scratched on stone.....	1, 295.98
Enos, 1,000 feet from post-office, southeast corner of small red schoolhouse north side of road; projecting corner stone.....	1, 295.98
County-line stone between Oneida and Herkimer counties, at fork of roads to North and Maple lakes; top of stone.....	1, 387.23
Maple Lake, outlet of, west abutment of bridge over; copper bolt marked "1318 U.".....	1, 317.401
Black River, east side of south abutment of bridge over; copper bolt marked "1598 R".....	1, 596.698

McKeever and Old Forge quadrangles.

WHITE LAKE TO OLD FORGE, VIA M'KEEVER AND FULTON CHAIN.

White Lake station, 2½ miles north of, and 100 feet north of White Lake Granite Company's switch, west of track at foot of embankment; iron staple set in bowlder 20 feet broad.....	1, 456.25
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	Feet.
White Lake Granite Company's switch, 1 mile north of; chiseled square on north end of east parapet of culvert.....	1,530.05
Otter Lake, 15 feet north of walk west of railroad track and midway between it and hotel; square chisel mark on boulder 8 feet wide	1,548.75
McKeever, 600 feet south of station, west of railroad track, in rock in cut; copper bolt, marked "U.S.G.S.R. 1544 Ft. B.M."	1,543.259
McKeever, 2 miles north of; iron railway bridge No. 6 (20-foot span); chiseled square near face corner end of coping, northwest wing.....	1,558.55
McKeever, 2½ miles north of, at Nelson Lake dam; chiseled square in boulder 6 feet east of track, 150 feet south of house.....	1,615.42
McKeever, 3½ miles north of, at railroad bridge No. 37 (90-foot span), over Moose River; chiseled square on face angle, north abutment, west end, 1 foot from girder	1,640.77
Minnehaha station, Moose River bridge; chiseled square on face corner, east end of parapet, north end.....	1,690.82
Fulton Chain station, 3 miles south of, 500 feet north of house; chiseled square on north end of parapet, south end of culvert	1,713.71
Fulton Chain, ¼ mile south of, opposite lock; railroad spike in side of first telegraph pole south of trail to lock	1,696.24
Fulton Chain, 5 feet north of Wakeley's Hotel, 8 feet east of railroad track; cross mark on bronze tablet set in boulder, marked "R 1712"...	1,711.285
Old Forge, ¼ mile west of railroad station, at picnic ground; boulder 12 feet square and 7 feet high, 15 feet north of railroad track; cross mark in bronze tablet, marked "R 1733".....	1,731.946

OLD FORGE, ALONG NORTH SIDE OF FULTON CHAIN LAKES, TO EAGLE BAY OF FOURTH LAKE.

Old Forge, 2½ miles northeast of, at summit; horseshoe nail in hemlock stump, north edge of road	2,008.92
Old Forge, 3½ miles northeast of, at outlet of Bald Mountain Pond; chiseled square on boulder 6 feet wide and 3 feet high at northwest corner of corduroy bridge.....	1,961.79
Bald Mountain, west side of trail to, from Bald Mountain House, where trail crosses road from Old Forge to Eagle Bay of Fourth Lake; root of birch stump, south side of road, west side of trail.....	1,828.63
Third Lake, Fulton Chain, at Bald Mountain House; bronze cap on iron bench-mark post, 40 feet east of dock, 8 feet from north shore of lake, marked "R 1712".....	1,711.594
Bald Mountain trail, 3 miles east of, opposite road to Lawrence Camp; chiseled square on boulder 8 feet wide, 10 feet south of road	1,743.87
Eagle Bay, 40 feet west of road to dock, 50 feet from shore of lake; chiseled square on outcrop in front of hotel	1,720.03

FOURTH LAKE, VIA SIXTH LAKE DAM, TO FAWN LAKE.

Fourth Lake, Fulton Chain, at Hess Inn; iron bench-mark post set in ground on north bank of Fifth Lake outlet, 40 feet north of boathouse and billiard room, 70 feet south of main hotel building, 175 feet east of sea wall on lake front of lawn, 3 feet northeast of sidewalk crossing, bronze cap, marked "R 1717".....	1,715.837
Sixth Lake, Fulton Chain, 125 feet east of north end of dam; boulder 10 feet broad, 4 feet high, 4 feet from edge of dock, bronze tablet, marked "R 1788".....	1,786.842
Sixth Lake dam, 1.6 miles south of; summit Seventh Lake Mountain; boulder 5 feet broad, 8 feet west of road, chiseled square	2,133.49
Fawn Lake, 500 feet east of, at bridge over inlet; notched root of birch tree 10 inches in diameter, 10 feet east of bridge on north bank of creek.	1,949.65

	Feet.
Fawn Lake, 1½ miles south of, on road from Sixth Lake to Kenweils, 900 feet south of summit, 25 feet north of small brook; boulder 12 feet square, 8 feet high, 10 feet east of road at south end of level stretch of road, cross mark on bronze tablet, marked "R 2263".....	2, 261. 499

WHITE LAKE TO HONNEDAGA, VIA NORTH LAKE.

White Lake, 50 feet west of railroad track at station, 5 feet north of roadway; large boulder, copper bolt, marked "U.S.G.S. 1421 Ft. A".....	1, 420. 096
White Lake, 1½ miles east of; rock north side of road marked with chiseled square and figures 1536.....	1, 534. 98
White Lake, 2.8 miles east of; rock north side of road marked with chiseled square and figures 1661.....	1, 660. 10
White Lake, 2.7 miles east of; rock north side of road marked with chiseled square and figures 1681.....	1, 683. 21
North Lake, 10 miles west of; rock north side of road marked with chiseled square and figures 1627.....	1, 626. 19
North Lake, 8.9 miles west of; rock east side of road marked with chiseled square and figures 1781.....	1, 780. 67
North Lake, 7.5 miles west of; large rock north side of road marked with chiseled square and figures 1958.....	1, 957. 43
North Lake, 6.3 miles northwest of, at junction of road to Woodhull Lake; aluminum tablet in top of rock, marked "1947 A".....	1, 946. 760
North Lake, 4.8 miles northwest of, 60 feet south of 5-mile post; rock east side of road marked with chiseled square and figures 1852.....	1, 851. 58
North Lake, 3.8 miles northwest of; rock west side of road marked with chiseled square and figures 1931.....	1, 929. 98
North Lake, 2.6 miles northwest of; rock west side of road marked with chiseled square and figures 1979.....	1, 977. 91
North Lake, 0.9 mile northwest of, at summit of hill in road to Sand Lake; rock marked with chiseled square and figures 2050.....	2, 049. 34
North Lake, 100 feet east of statehouse in rock; aluminum tablet, marked "1829 R".....	1, 827. 676
Honnedaga, 3.4 miles west of; top of large rock south side of road, chiseled square and figures 2023.....	2, 022. 18
Honnedaga, 2.4 miles west of; top of large rock north side of road; chiseled square and figures 2032.....	2, 031. 28
Honnedaga, 1.1 miles west of; chiseled square on rock south side of road, figures 2225.....	2, 253. 93
Honnedaga Lake, 400 feet west of, on road to North Lake; large rock north side of road, copper tablet, marked "2221 A".....	2, 220. 530
Honnedaga, 50 feet south of south end of boathouse at head of lake; chiseled square on rock, marked "2195".....	2, 194. 34

*Canada Lake, Indian Lake, and Piseco quadrangles.*HONNEDAGA LAKE, VIA THIRD STILLWATER, WEST CANADA LAKES, AND CEDAR LAKES, TO
LITTLE MOOSE LAKE.

Honnedaga, Forest Lodge; south face of large boulder 50 feet north of office building; aluminum tablet marked "2205 A".....	2, 204. 435
Forest Lodge, 15 feet southeast of southeast corner of small boat house; boulder at water's edge; chiseled circle.....	2, 194. 338
Honnedaga, 0.9 miles east of, 15 feet south of blazed birch; moss-covered boulder in trail; chiseled circle.....	2, 326. 25
Honnedaga, 1.3 miles east of, at Herkimer-Hamilton county boundary line; large boulder north side of trail; bolt of transit station No. 21 of county line survey.....	2, 148. 81

	Feet.
Honnedaga, 2 miles east of, and 5 feet east of road to Jones Lake; rock in trail; chiseled circle	2, 144. 10
Honnedaga, 3.1 miles east of, and 0.9 miles east of Swanson Dam; boulder in road, 6 feet north of blazed maple tree; chiseled circle.....	2, 230. 94
Honnedaga, 4.2 miles east of, and 2 miles east of Swanson Dam; boulder in road, 8 feet north of blazed birch, marked "O"	2, 126. 63
Honnedaga, 5.1 miles east of, and 2.9 miles east of Swanson Dam; 10 feet south of road, 8 feet west of blazed maple tree; boulder; chiseled circle..	2, 175. 86
Honnedaga, 6.4 miles east of, at turn of road in swamp; boulder, 12 feet south of blazed balsam north of road; chiseled circle.....	2, 174. 23
Honnedaga, 7 miles east of; boulder in road, 10 feet south of blazed balsam; chiseled circle.....	2, 180. 77
Honnedaga, 7.8 miles east of, and 250 feet east of ford of West Canada Creek near head of Second Stillwater; boulder in road; aluminum tablet marked "2168 A"	2, 167. 477
West Canada Creek ford, 0.6 mile east of, at forks of road, foot of hill east of swamp; boulder, 10 feet north of blazed birch, marked "B. M. 2239" ..	2, 238. 64
West Canada Creek ford, 1.6 miles east of; boulder in road marked with square and legend "B. M. 2347"	2, 346. 41
West Canada Creek ford, 3.7 miles east of; boulder in road marked with square and "B. M. 2399"	2, 398. 74
West Canada Creek, 4.5 miles east of; boulder south of road marked with chiseled square and legend "B. M. 2430"	2, 429. 31
West Canada Creek ford, 4.8 miles east of, near trail to North and South Canada lakes; large birch south side of road marked "B. M. 2406;" nail in root.....	2, 405. 13
Mud Lake Dam, 125 feet north of sluice of; 100 feet north of Indian hut; large white boulder; aluminum tablet marked "2356 A"	2, 355. 132
Mud Lake, 0.7 mile east of, and 20 feet of Club boundary line; spruce tree marked "B. M. 2374," on south side of road; nail in root	2, 373. 69
Little Moose Landing, 150 feet east of, on trail; two trees marked "B. M. 2442;" nail in root of one.....	2, 441. 81
Buck Camp, 400 feet east of Cedar Lake, on trail to Speculator; northwest corner of camp; copper bolt marked "U. S. G. S. B. M. 2472 Ft. A"	2, 471. 839
Cedar Lake, 1.0 mile north of on trail to Little Moose Lake; top of rock in trail, marked with chiseled square and figures "2449"	2, 448. 84
Cedar Lake, 2.2 miles north of; chiseled square on rock in trail, near two trees marked "2453"	2, 452. 79
Cedar Lake, 1.7 miles north of, at intersection of trail and Military road; tree marked "2517;" nail in root.....	2, 516. 62
Cedar Lake, 3.1 miles north of, on boundary line between Indian Lake and Lake Pleasant townships; tree marked "2376;" nail in root.....	2, 375. 58
Cedar Lake, 3.7 miles north of, at intersection of trail to Little Moose Lake with Military road; large rock marked with chiseled square	2, 274. 79
Little Moose Lake; intersection of trail from Cedar Lake with road from Wakeley Dam and Kenwells; two trees marked "2157;" nail in root of one.....	2, 156. 04
CEDAR RIVER HOUSE TO FAWN LAKE VIA WAKELEY DAM AND LITTLE MOOSE LAKE.	
Main road, $\frac{1}{4}$ mile from; square chisel mark on boulder 20 feet to right of and 1.7 feet above center of road, 275 feet back from small stream.....	1, 694. 08
Main road, $1\frac{1}{4}$ miles from; square chisel mark on boulder 6 feet to left of and 4.7 feet above center of road	1, 743. 43
Main road, 3 miles from; square chisel mark on boulder 30 feet to right of and 2.6 feet above center of road, 365 feet back from log house on left of road.....	1, 772. 95

	Feet.
Main road, 3½ miles from; square chisel mark on outcrop 8 feet to right of and 1.6 feet above center of road, 210 feet back from summit.....	1, 912. 61
Main road, 5½ miles from; square chisel mark on large boulder 28 feet to left of and 5.8 feet above center of road, 500 feet back from white frame schoolhouse on right of road	1, 866. 36
Potter's house, ¼ mile beyond; square chisel mark on boulder 21 feet to left of and 2.9 feet above center of road, 200 feet north of east of partly log and partly frame house on left of road.....	1, 876. 00
Brown's house, ¼ mile beyond and 7½ miles from main road; copper plug set in boulder 15 feet to right of and 5.3 feet above center of road, 20 feet north of bridge over small stream flowing to left, marked "U.S.G.S. B.M. 1918"	1, 912. 961
Brown's house, 1¼ miles beyond; square chisel mark on boulder 5 feet to left of and 2.8 feet above center of road, 300 feet beyond summit.....	1, 960. 50
Brown's house, 1½ miles beyond; square chisel mark on boulder 7 feet to right of and 3.5 feet above center of road, 50 feet northeast of pole bridge over brook flowing to left.....	2, 032. 70
Brown's house, 2¼ miles beyond; square chisel mark on boulder 7 feet to right of and 3.9 feet above center of road, 7 feet southeast of blazed beech tree	2, 084. 34
Wakeley Pond outlet, 12 feet beyond bridge over; square chisel mark on boulder 4 feet to right of and 1 foot above center of road.....	2, 093. 22
Wakeley Dam; copper plug in boulder 25 feet east of north of log house at, marked "U.S.G.S. 2124 Ft. B.M."	2, 119. 174
Wakeley Dam, 0.9 mile west of; top of large rock, north side of road, near two trees marked "2203;" chiseled square.....	2, 203. 13
Wakeley Dam, 1.8 miles west of; nail in root of one of two trees south side of road marked "2254"	2, 254. 30
Wakeley Dam, 2.6 miles west of; 150 feet east of large spring; nail in root of tree marked "2141"	2, 141. 85
Wakeley Dam, 3.8 miles west of; tree marked "2171;" nail in root.....	2, 171. 41
Wakeley Dam, 4.3 miles west of; tree marked "2240;" nail in root.....	2, 239. 92
Wakeley Dam, 5.4 miles west of; tree marked "2236;" nail in root.....	2, 236. 23
Little Moose Lake, 200 feet from; large rock in rear of log house; copper bolt marked "U.S.G.S. B.M. 2143 A"	2, 143. 594
Little Moose Lake, 1.2 miles west of; tree marked "2130;" nail in root..	2, 130. 86
Little Moose Lake, 1.9 miles west of; tree marked "2081;" nail in root..	2, 081. 22
Little Moose Lake, 3.5 miles west of; trees marked "2055;" nail in root..	2, 055. 46
Little Moose Lake, 4.5 miles west of; on road to Kenwells, 0.3 mile west of Silver Run, at summit of hill; in large rock, 5 feet south of road, marked "2049 A;" aluminum tablet.....	2, 048. 993
Little Moose Lake, 5.7 miles west of; tree marked "2024;" nail in root..	2, 023. 98
Little Moose Lake, 7.2 miles west of; tree marked "1984;" nail in root..	1, 984. 91
Little Moose Lake, 7.9 miles west of; tree marked "1879;" nail in root..	1, 879. 34
Little Moose Lake, 8.8 miles west of; on plains, 1,000 feet west of wood; rock, in road, marked with chiseled square and figures "1869"	1, 869. 43
Kenwells, 3,150 feet northeast of; large rock, north side of road to Fourth Lake and Wakeley Dam; aluminum tablet marked "1854 A"	1, 854. 89
Kenwells, 2 miles north of, on road to Fourth Lake; tree marked "2004;" nail in root.....	2, 004. 23
Kenwells, 2.7 miles north of, on road to Fourth Lake; tree marked "2066;" nail in root.....	2, 066. 72
Kenwells, 3.6 miles north of, on road to Fourth Lake; tree marked "2174;" nail in root.....	2, 174. 31
Kenwells, 4.7 miles north of, and 100 feet north of Red River; rock in road marked "1881;" chiseled square.....	1, 881. 81

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Kenwells, 5.4 miles north of; tree marked "2028;" nail in root.....	2, 028. 83
Kenwells, 6.2 miles north of; tree marked "2204;" nail in root.....	2, 204. 53

MOREHOUSEVILLE TO SPECULATOR, VIA PISECO.

Morehouseville, 1.1 miles east of; top of rock, south side of road, marked with chiseled square and figures "1776".....	1, 774. 77
Morehouseville, 2.3 miles east of; top of rock, north side of road, marked with chiseled square and figures, "1846".....	1, 845. 30
Morehouseville, 2.7 miles east of, 50 feet west of church; rock, south side of road, marked with chiseled circle and legend "B.M. G. of N. Y. State Land Survey"; also marked "U.S.G.S. B.M. 1839".....	1, 838. 23
Morehouseville, 4 miles east of; top of rock, north side of road, marked with chiseled square and figures "2125".....	2, 124. 18
Morehouseville, 5.5 miles east of; top of rock, south side of road, marked with chiseled square and figures "1975".....	1, 973. 65
Morehouseville, 6.6 miles east of, 40 feet west of road to G lake; top of rock, south side of road, marked with chiseled square and figures "1927".	1, 926. 59
Morehouseville, 7.8 miles east of; top of rock, south side of road, marked with chiseled circle and legend "B.M. W. New York State Land Survey"; also marked "U.S.G.S. B.M., 1866".....	1, 864. 73
Morehouseville, 8.6 miles east of; 500 feet west of Lampey Camp; top of rock, north side of road, marked with chiseled square and figures "1800".	1, 799. 52
Piseco Lake inlet; bridge floor.....	1, 693
Morehouseville, 10.6 miles east of; top of rock, south side of road; chiseled square and figures "1679".....	1, 677. 86
Morehouseville, 11.6 miles east of; top of rock, north side of road; chiseled square, figures "1734".....	1, 732. 79
Morehouseville, 13.3 miles east of; top of rock, south side of road; chiseled square and figures "1691".....	1, 689. 72
Morehouseville, 14 miles east of; top of rock, north side of road; chiseled square and figures "1691".....	1, 689. 75
Piseco, Irondequoit club house basement; aluminum tablet marked "1703 A".....	1, 702. 163
Piseco, 0.4 mile east of; top of rock, south side of road, chiseled square and figures "1675".....	1, 673. 90
Piseco, 1.7 miles east of, 200 feet east of yellow house; top of rock, north side of road; chiseled square and figures "1717".....	1, 716. 47
Piseco, 2 miles east of, at junction of roads to Lake Pleasant and Gloversville, 50 feet north of road to Piseco; top of rock marked with chiseled square and figures "1729".....	1, 727. 82
Piseco, 3 miles east of, 600 feet west of old house; large boulder north side of road, marked with chiseled square and figures "1721".....	1, 720. 13
Piseco, 3.7 miles east of, 2 miles west of sawmill and 300 feet west of David Aird's house, by small creek, and near balsam tree; rock, north side of road, marked with chiseled square and "U.S.G.S. B.M. 1732".....	1, 731. 39
Lake Pleasant, 3½ miles west of; top of stone, north side of road opposite house.....	1, 724
Lake Pleasant, 2½ miles west of, 300 feet east of white schoolhouse; large boulder south side of road, chisel mark on north corner.....	1, 821. 31
Lake Pleasant, 1½ miles west of; large boulder, in field north of road, marked by Colvin survey "B.M. H;" chisel mark.....	1, 821. 02
Lake Pleasant; north side of stone jail, six inches east of northeast corner, 3½ feet above ground; aluminum tablet, marked "1791 A".....	1, 789. 723
Lake Pleasant, 1 mile east of, and 75 feet east of second house east of Sacandaga Lake outlet on north of road; large boulder, north side of road; chisel mark.....	1, 750. 80

	Feet.
Lake Pleasant, 2 miles east of, and 700 feet east of large white house on north side of road; chiseled square on step of very large boulder north side of road.....	1,758.97
Speculator, boulder in small triangular park at crossroads; copper bolt, marked "1772 A." (This bolt was set in 1896, and its elevation has been published as 1,767.200.)	1,767.506

PISeco, TO THIRD STILLWATER OF WEST CANADA CREEK, VIA SPRUCE LAKE.

Piseco, 0.9 mile north of; tree marked "1704;" nail in root.....	1,702.74
Piseco, 1.9 miles north of; tree marked "1742;" nail in root.....	1,740.91
Piseco, 2.8 miles north of; tree marked "1805;" nail in root.....	1,803.94
Piseco, 3.5 miles north of; tree marked "1878 B.M.;" nail in root.....	1,876.70
Piseco, 4.2 miles north of; tree marked "2008 B.M.;" nail in root.....	2,007.12
Piseco, 5 miles north of; nail in root of tree marked "1969 B.M.".....	1,968.24
Piseco, 5 miles north of, and 50 feet north of old road running northeast to old lumber camp; large boulder 10 feet east of road; copper bolt, marked "1964 A"	1,963.578
Piseco, 6.1 miles north of; top of rock in road marked with chiseled square and figures "2230".....	2,229.13
Piseco, 6.9 miles north of; tree marked "2179 B.M.;" nail in root.....	2,178.60
Piseco, 7.7 miles north of; north bank of Jessup River; stump, marked "2068 B.M.;" nail in root.....	2,067.61
Piseco, 8.6 miles north of; tree marked "2305 B.M.;" nail in root.....	2,304.56
Piseco, 9.9 miles north of; tree marked "2460 B.M.;" nail in root.....	2,459.14
Spruce Lake, east side of, at Clarks Camp, large boulder; copper bolt, marked "2382 A"	2,381.539
Spruce Lake, 0.9 mile north of; trees marked "2429 B.M.;" nail in root ..	2,428.55
Spruce Lake, 2.8 miles west of, in old road, 200 feet west of camp, 10 feet west of creek; rock, marked "U.S.G.S. 2230 B.M.;" chiseled square ...	2,223.17

Fonda, Gloversville, Fayville, and Speculator quadrangles (republished and amended).

AURIESVILLE TO GILMAN LAKE, VIA FONDA, GLOVERSVILLE, AND NORTHVILLE.

Schoharie Creek Aqueduct, Erie Canal; cross on cornerstone of northwest abutment of first bridge west of (U. S. Engineer Corps B.M.)	301.770
Auriesville, West Shore Railroad station, bridge over canal $\frac{1}{2}$ mile west of; square chiseled in cornerstone, northwest end of west wing, north abutment	302.31
Auriesville, West Shore Railroad station, bridge over canal $\frac{1}{2}$ mile west of; cross cut in stone in fourth course north abutment, $1\frac{1}{2}$ feet east of east angle of abutment.....	301.85
River road crossing, south abutment of bridge over canal at; square chisel mark on northeast corner of east stone of third course.....	299.95
Fultonville, bridge over Mohawk River, $\frac{1}{2}$ mile east of; top of stone monument on north side of river road.....	288.09
Fultonville, bridge over Mohawk River; square chisel mark on top of coping south abutment.....	293.55
Fonda, county court-house; cross on bronze tablet set in corner stone of fourth course of stones from top of foundation at northwest corner, marked "294"	293.153
Cayadutta Creek, Fonda, Johnstown and Gloversville Railroad bridge over; square chisel mark in northeast corner of coping stone, southeast end of south abutment.....	350.10
Fonda, 2 miles north of; cross cut in face of stone in north wall of Fonda, Johnstown and Gloversville Railroad culvert No. 2.....	464.18

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Sammons ville; Fonda, Johnstown and Gloversville Railroad station; cross cut in large stone at south corner of foundation.....	588.58
Sammons ville railroad station, 1½ miles north of, on Fonda, Johnstown and Gloversville Railroad; cross cut in stone in face of southwest wall of culvert	649.56
Johnstown; Fonda, Johnstown and Gloversville Railroad crossing at Montgomery street, 60 paces northeast of; cross cut in stone, west corner of foundation of frame house on southeast side of street.....	648.60
Johnstown; Fonda, Johnstown and Gloversville Railroad station; cross on bronze tablet set in first stone below brickwork at west corner of building, marked "652"	651.295
Johnstown, 1½ miles north of, on Fonda, Johnstown and Gloversville Railroad; square chisel mark in southeast corner of top stone of west wall of culvert No. 2.....	722.19
Johnstown, 2½ miles north of, on Fonda, Johnstown and Gloversville Railroad bridge No. 5; square chisel mark on northeast corner of top stone, east end of abutment	748.87
Gloversville; square cut in southwest corner of stone in north abutment of bridge No. 6, Fonda, Johnstown and Gloversville Railroad, 100 paces from Main street.....	768.35
Gloversville; Fonda, Johnstown and Gloversville Railroad station; cross in bronze tablet set in first stone below brickwork 20 feet north of southwest corner of building, marked "798"	797.355
Gloversville, southeast corner of Bleeker street, near east-iron post, bridge over Cayadutta Creek; square chisel mark in top of stone, south abutment	808.77
Gloversville, Kingsboro avenue, ¼ mile west of Kingsboro avenue station; square chisel mark on stone in east wall of culvert	850.25
Gloversville, Kingsboro avenue, frame house on west side of, 100 feet north of railroad crossing; cross cut in stone near southeast corner of foundation	873.94
Gloversville, 2 miles north of Kingsboro avenue station on Fonda, Johnstown and Gloversville Railroad; square cut in stone in west wall of cattle pass.....	812.88
Broadalbin Junction, top of frog in switch at.....	812.22
Mayfield, 1 mile south of; northwest corner of west coping of arch culvert, square chisel mark	772.16
Mayfield; platform at railroad station	762.1
Mayfield; iron highway bridge, floor of	762.8
Mayfield, 60 feet east of gristmill, 30 feet from creek, and 90 feet south of railroad track; copper bolt in boulder 5 feet broad, marked "U.S.G.S.; B.M. 756 Ft."	751.266
Van Nostrand's, 2,000 feet southwest of railroad station opposite northeast end of curve; square chisel mark on ontcrop 15 feet west of track	744.07
Cranberry Creek, 2½ miles south of railroad station; square chisel mark on boulder 300 feet west of railroad track, half way to barn.....	740.25
Cranberry Creek, Main street, 300 feet north of railroad crossing and 100 feet west of railroad track; copper bolt in boulder 3 feet high, marked "U.S.G.S.; B.M. 768 Ft."	762.668
Sweets Crossing, 200 feet north of, and 20 feet west of railroad track; square chisel mark on boulder 8 feet broad.....	826.04
Sacandaga Park schoolhouse, ¼ mile east of, 30 feet north of open culvert, 20 feet east of railroad; square chisel mark on boulder.....	804.47
Sacandaga Park schoolhouse, ground elevation at base of.....	804.9
Sacandaga Park, ¼ mile south of; road crossing	811.0

	Feet.
Sacandaga Park, 125 feet south of road crossing at; boulder 60 feet west of main line railroad, square chisel mark	813. 19
Sacandaga Park; road crossing.....	807. 5
Northville, Sacandaga River; floor of bridge over	761. 92
Northville, Sacandaga River, bridge over; copper bolt in top step, north wing of west abutment marked "U.S.G.S. B.M. 765 Ft."	760. 044
Northville railroad station, platform of.....	763. 85
Northville, 1 mile above; square chisel mark on boulder 4 feet west of road at south edge of clearing on west side of river.....	758. 34
Van Vranken's (white) house; base of.....	769. 0
West Stony Creek, first house (white) south of iron bridge over; base of..	786. 0
Northville, 3 miles north of, 50 feet north of West Stony Creek iron bridge and on west side of river; square chisel mark on boulder 10 feet west of road.	786. 62
Willard Cemetery; base of yellow house opposite, west side of river.....	790. 0
Falls Brook, floor of bridge over	796. 9
Sacandaga River, 40 feet from, on west bank; rock on south bank of brook, 20 feet west of road and 200 feet south of clearing, square chisel mark..	782. 48
Twenty-mile post, 150 feet north of; rock 20 feet east of road, marked "(B.M.○11.8)"	793. 53
Mitchell's Hotel, south step of piazza; stone marked "B.M.○123" with chisel.....	806. 48
Mitchell's white house; base of.....	806. 5
Hope District Schoolhouse No. 4; base of.....	832. 0
Hope District Schoolhouse No. 4, 75 feet west of; boulder 15 feet north of road, copper bolt in, marked "U.S.G.S. B.M. 832 Ft."	827. 239
Fifteen-mile post, 200 feet north of; boulder 15 feet west of road, marked "B.M.○134"	890. 22
Hotel, painted white, at southeast corner of road to east base of.....	900. 5
Fourteen-mile post, 150 feet northeast of; boulder at foot of hill, marked "B.M.139" with chiseled circle.....	909. 64
West River (West Branch of Sacandaga River), opposite mouth of; 300 feet south of 13-mile post, boulder 50 feet east of river bank; square chisel mark	909. 32
Wells tannery, 1½ miles south of; boulder 15 feet east of road and 100 feet south of house, marked "B.M.○143"	954. 10
Wells; 500 feet north of tannery, in flat; boulder 20 feet east of road and 75 feet south of large barn, marked "B.M. 147" with chiseled circle....	1, 012. 05
Wells; base of white church fronting west	1, 009. 2
Wells; base of yellow church with square-topped tower, fronting east....	1, 012. 45
Wells; Hosley House; bronze tablet on rock 15 feet broad and 5 feet high in back yard of hotel, marked "1026"	1, 021. 191
Wells; east end of abutment of covered bridge, marked "B.M.B.X." with chiseled circle	987. 65
Patent line monument in yard of white house opposite road to east; stone set in ground 15 feet southeast of house, marked thus \triangle ; triangle is 6 inches on each side.....	1, 017. 04
Elbow Bridge; stone 10 feet south of, and 4 feet west of road, marked "B.M.C.C." with chiseled circle	1, 348. 26
Hamilton Lake, angle of road to; boulder 6 feet high and 15 feet broad, 40 feet from each road, west of junction, marked "B.M.A." with chiseled circle.....	1, 692. 31
Charley Lake, schoolhouse opposite; copper bolt in boulder 8 feet broad, 25 feet southwest of school; bolt is marked "U.S.G.S.; B.M.1719 Ft." ..	1, 713. 768
Charley Lake, water surface	1, 692. 44

	Feet.
Charley Lake; boulder 25 feet southwest of schoolhouse opposite, marked "B.M.C.G." with chiseled circle	1,713.62
Gilman Lake outlet, 400 feet south of bridge over; boulder 10 feet broad, 3 feet high, 40 feet east of road, marked with chiseled circle over legend "B.M.C.H."	1,670.02
Gilman Lake outlet, floor of bridge over	1,651.16
Gilman Lake, white house opposite center of; stone 100 feet south of building, 10 feet east of road, at trail to Griffin. This stone is marked with chiseled circle above legend "B.M.C.K." and is located 15 feet north of a stone marked in a similar manner with legend "B.M.C.J."	1,729.39
Speculator, small triangular park at crossroads; copper bolt, set in boulder (P 40 B 1), marked "U.S.G.S.; 1772 Ft.B.M."	1,767.506

MARYLAND, PENNSYLVANIA, AND WEST VIRGINIA.

GARRETT, ALLEGANY, AND WASHINGTON COUNTIES, MARYLAND; SOMERSET, FAYETTE, FULTON, AND FRANKLIN COUNTIES, PENNSYLVANIA; GRANT, PRESTON, BERKELEY, HAMPSHIRE, AND MINERAL COUNTIES, WEST VIRGINIA.

GRANTSVILLE, ACCIDENT, OAKLAND, FLINTSTONE, PAWPAW, AND HANCOCK QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the Allegany County court-house at Cumberland, Maryland, and marked "C 688." This bench mark is based on the United States Coast and Geodetic Survey transcontinental line of precise levels, and dependent on this its height is accepted as 687.627 feet above mean sea level. These elevations were connected at various places, as shown in the following list, with other bench marks of the Coast Survey transcontinental line besides that at Cumberland. All of these Coast Survey bench marks have been reduced from the elevations published in the Appendix for the report of 1882 by the amount — 0.03 meters, the constant correction found at Hagerstown as published in the Coast Survey report for 1896.

The leveling was done under the general direction of Mr. J. H. Jennings, topographer, by Messrs. Hargraves Wood and C. B. Bailey, levelmen.

All bench marks dependent on this datum are marked with the letter "C" in addition to the figures of elevation:

THAYERVILLE TO KEYSER, VIA M'HENRY, HOYS, AND ACCIDENT.

	Feet.
Thayerville, 2 miles north of; north approach to Deep Creek bridge; bolt head	2,421.46
McHenry, 2.2 miles south of, on old road, in edge of woods; red oak tree 12 inches in diameter south side of main road; nail in blaze near roots	2,514.54
McHenry, 1.8 miles south of; 100 feet south of D. W. Fraker's house; cherry tree 12 inches in diameter; nail in blaze near roots	2,519.76
McHenry, 0.59 mile north of; 100 feet north of road to Sang Run; white-oak tree (west side of road) 18 inches in diameter; nail in blaze near roots	2,501.20
Hoys, Catholic church; southeast corner of foundation wall; aluminum tablet, marked "2611 C"	2,612.009

	Feet.
Accident, 1.07 miles south of; post oak tree 14 inches in diameter east side of road; nail in blaze near roots.....	2,340.89
Accident, English Lutheran church; aluminum tablet, in northeast corner of foundation; marked "2394 C".....	2,395.192
Accident; spike in base of flag pole near blacksmith shop.....	2,419.65
Accident, 1.64 miles north of, near crest of hill; chestnut oak tree 35 inches in diameter on west side of road; nail in blaze on root.....	2,415.26
Cove, 150 feet south of post-office; cherry tree 14 inches in diameter; nail in blaze on root.....	2,206.9
Cove, 0.28 mile north of; at intersection of Cove and Accident roads; chestnut tree 20 inches in diameter by Dunkard church; nail in blazed root.....	2,485.22
Keyser, 1.05 miles south of; white oak tree 20 inches in diameter north side of road; nail in blaze on root.....	2,933.92
Keyser, post-office building; northeast corner of stone foundation wall; bronze tablet, marked "2879 C".....	2,880.389

FROSTBURG TO BLOOMINGTON, VIA PINEY GROVE, NEW GERMANY, AND CRABTREE.

Frostburg; bronze tablet in rock cut south side of Cumberland and Pennsylvania Railroad, 50 feet east of tunnel, marked "1929 C".....	1,928.550
Frostburg; top of milepost; "Cumberland, 11 mi.".....	2,020.16
Frostburg, office Hotel Gladstone; stone doorsill.....	2,074.148
Frostburg, west end of; at top of hill; pike north side of; on rock.....	2,198.89
Frostburg, 1.75 miles west of; on large nut for hinge on east side of south post of old tollgate.....	2,473.39
Frostburg, 3.7 miles west of; nail in root of large chestnut tree northwest corner road to Pocahontas.....	2,617.27
Frostburg, 4 miles west of; top of milepost to "Cumberland, 15 mi.".....	2,577.16
Frostburg, 5.1 miles west of; new house and large barn; nail in top of gatepost.....	2,613.50
Frostburg, 6 miles west of; milepost "17 mi. to Cumberland".....	2,625.12
Frostburg, 7 miles west of; milepost "18 mi. to Cumberland;" 600 feet west of church.....	2,628.25
Frostburg, 8 miles west of; milepost "19 mi. w. to Cumberland;" top of..	2,589.46
Piney Grove, $\frac{1}{4}$ mile east of; near east corner of large house on north side of pike; 200 feet west of Twomile Run; bronze tablet, marked "2424 C".....	2,424.045
Piney Grove; east side of road to New Germany; spike in telegraph pole opposite deserted house.....	2,648.91
New Germany, 4 miles north of; nail in root of small chestnut tree on east side of road; 15 feet south of road to west.....	2,732.18
New Germany, 2.6 miles north of; nail in roof of large chestnut tree on west side of road, and 6 miles south of Pat Dorsey's.....	2,748.65
New Germany, 1.4 miles north of; nail in root of large chestnut tree on west side of road on edge of woods.....	2,677.58
New Germany, 1 mile north of; northeast angle of crossroads opposite Mount Beulah Church; horse block, marked "2729 C".....	2,728.79
New Germany, 0.1 mile west of; 100 feet west of Horse Pond Creek; 20 feet south of road to Oakland at intersection of road to old mill; bronze tablet in ledge of rock, marked "2472 C".....	2,471.730
New Germany, 1.3 miles south of; nail in root of chestnut tree at road running north.....	2,503.87
New Germany, 3.3 miles south of; southeast angle of intersection of roads to Bear Pen Run and Settlement road; small red-oak tree.....	2,471.92
New Germany, 5.6 miles south of; 6 miles east of intersection of roads; 100 feet west of crossing of Bear Pen Run; nail in root of maple tree..	2,226.23

	Feet.
New Germany, 8 miles south of; Savage River at mouth of Bear Pen Run; 0.15 mile west of, at edge of clearing; north side of road down Bear Pen; bronze tablet in ledge of rock, marked "1578 C"	1,577.741
Bear Pen Run, 1 mile south of mouth of; opposite schoolhouse and at road running east; north side of road down Savage River; nail in root of apple tree	1,502.55
Bear Pen Run, 2 miles south of mouth of; 200 feet south of Big Run, at northwest angle of road; nail in root of leaning black-walnut tree	1,464.96
Crabtree Run; west end of bridge over; nail in south side of log abutment.....	1,366.83
Floyd post-office, known as Frankville; 0.12 mile east of station; milepost "214 to Baltimore," 0.09 mile west of; south side Baltimore and Ohio Railroad, at east end of frame house; bronze tablet in large rock, marked "1693"	1,692.978
Frankville, 1 mile east of; 200 feet east of Crabtree switch; spike in telegraph pole north side of Baltimore and Ohio Railroad	1,549.04
Frankville, 2.6 miles east of; 100 feet east of signal station; south side of Baltimore and Ohio Railroad; bench mark in Lafey rock; bronze tablet, marked "1380 C"	1,379.976
Frankville, 5 miles east of; milepost No. 209 to Baltimore; top of.....	1,097.82
Bloomington, bridge over Potomac at; on top step, northwest corner Baltimore and Ohio Railroad bridge.....	1,008.54

NEW GERMANY TO THAYERSVILLE, VIA MEADOW MOUNTAIN ROAD.

New Germany, 3.4 miles southwest of; at fork of road to Bittering; south-east side Meadow Mountain road; nail in root of maple tree	2,590.66
New Germany, 8 miles southwest of; 0.2 mile northeast of Dry Run road; log bridge over small stream; 150 feet southwest of and north side of road; nail in root of large white-oak tree	2,497.39
Thayersville, 5.8 miles east of; near Meadow Mountain Run; old sawmill site, 500 feet northeast of; on north side of Meadow Mountain road; bronze tablet in rock, marked "2573"	2,573.616
Thayersville, 3 miles east of; opposite road to southeast; nail in root of white-oak tree.....	2,631.98
Thayersville, 5.3 miles east of; 0.4 mile southwest of deserted sawmill; south side of road; nail in root of maple tree	2,534.96
Thayersville, 1½ miles northeast of; Deep Creek bridge at Maryland State fish pond; nail in floor of bridge near southeast end.....	2,426.8
Thayersville, 700 feet of on south side of Meadow Mountain road; 150 feet east of intersection of Meadow Mountain road and road from Thayersville to Oakland; bronze tablet in bowlder, marked "2493 C"	2,493.654

PINEY GROVE TO GRANTSVILLE.

Piney Grove, 0.9 mile west of; top of Meadow Mountain on north side of pike; nail in root of chestnut tree.....	2,791.64
Grantsville, 3 miles east of; at southwest angle of road to Salisbury; nail in root of large oak tree	2,676.17
Grantsville, 2 miles east of; milepost "12 mi. to Frostburg" on top of....	2,456.30
Grantsville, 0.9 mile east of; at southeast corner of road intersection; top of large rock, marked "2155"	2,155.04
Grantsville, Farmers' Hotel at; in southeast corner stone, opposite milepost "14 mi. to Frostburg" and "106 mi. to Wheeling;" aluminum tablet, marked "2299 C"	2,299.196

M'HENRY, MARYLAND, TO SOMERFIELD, PENNSYLVANIA, VIA SANG RUN, FRIENDSVILLE, AND
SELBYSPOUT.

	Feet.
Friendsville, southeast corner of First avenue and Maple street; east foundation wall of building owned by L. E. Friend; aluminum tablet, marked "1501 C".....	1,501.231
Krug; railroad water tank; nail in north west corner of sill.....	1,570.60
Krug, 1 mile south of; 50 feet north of cabin, between narrow-gauge railroad and Youghiogheny River; nail in stump.....	1,619.61
Krug, 2.3 miles south of; 150 feet south of Fike's store; nail in root of cherry tree between railroad and river.....	1,721.06
Sang Run, $\frac{1}{4}$ mile east of; nail in root of blazed apple tree north side of road.....	2,057.08
Sang Run; abutment of bridge over Youghiogheny River; aluminum tablet, marked "1989 C".....	1,988.600
Sang Run, 1 mile north of; nail in blaze on chestnut tree 30 inches in diameter, 50 feet east of railroad.....	1,981.63
Sang Run, 3 miles north of; chestnut oak tree 28 inches in diameter on west bank of Youghiogheny River, between river and railroad; nail in blaze.....	1,915.06
Friendsville, 1.4 miles north of; 50 feet west of Baltimore and Ohio Railroad; walnut tree 30 inches in diameter; nail in blaze.....	1,447.26
Selbysport, 60 feet north of station; spike in telegraph pole.....	1,423.70
Selbysport, 0.98 mile north of; on river bank 20 feet north of Baltimore and Ohio Railroad track; chestnut tree 16 inches in diameter; nail in blaze.....	1,415.69
Gise switch, 0.22 mile north of; maple tree, 36 inches in diameter, 40 feet east of Baltimore and Ohio Railroad track; nail in apex of blaze.....	1,407.47
Maryland-Pennsylvania boundary line; stone, in place, 10 feet south of State line on left bank of Youghiogheny River, on Baltimore and Ohio Railroad.....	1,405.45
Watsondale, Pennsylvania, 0.62 mile north of; spike in telegraph pole, left bank of river; Baltimore and Ohio Railroad.....	1,388.69
Watsondale, Pennsylvania, 2.55 miles north of; spike in telegraph pole between railroad track and wagon road.....	1,373.39
Somerfield, Pennsylvania; corner of Main and Water streets; foundation wall of brick building owned by J. W. Endsley; aluminum tablet, marked "1386 C".....	1,390.050

SOMERFIELD, PENNSYLVANIA, TO OAKTON, MARYLAND.

Somerfield, 1 mile east of; top of milepost marked "40 miles to Cumberland; 91 miles to Wheeling".....	1,645.80
Addison, 1.64 miles west of; nail in telegraph pole.....	1,808.65
Addison; bolt in telegraph pole near entrance to cemetery.....	2,021.86
Addison, 0.98 mile east of; 5 feet south of milepost "95 mi. to Wheeling; 36 mi. to Cumberland;" chiseled cross mark on boulder.....	2,109.34
Addison, 2 miles east of; top of stone milepost "35 mi. to Cumberland; 96 mi. to Wheeling".....	2,452.49
Addison, 3.36 miles east of; 420 feet west of Failing's barn; nail in root of white-oak tree 24 inches in diameter.....	2,473.85
Oakton, Pennsylvania-Maryland boundary; base of monument.....	2,362.56

THAYERSVILLE, MARYLAND, TO OAKLAND, MARYLAND.

Thayersville, 1 mile south of; nail in root of blazed chestnut tree, 20 inches in diameter, on west side of road.....	2,590.20
Thayersville, 2 miles southwest of; blazed chestnut tree, 12 inches in diameter; 100 feet south of watering trough; nail in root.....	2,702.05

	Feet.
Thayersville, 3 miles south of; nail in root of blazed oak tree, 30 inches in diameter, on west side of road.....	2, 781. 13
Thayersville, 4 miles south of; nail in root of blazed oak tree, 10 inches in diameter; on north side of road.....	2, 710. 93
Oakland, 3½ miles north of; nail in root of double blazed chestnut tree (30 and 12 inches in diameter); on east side of road.....	2, 615. 11
Oakland, 2½ miles north of; nail in root of oak tree, 24 inches in diameter, on west side of road; 100 feet north of white schoolhouse.....	2, 538. 78
Oakland, 1½ miles north of; nail in root of lone oak tree, 12 inches in diameter, on north side of road; 450 feet south of new house.....	2, 440. 05

BALTIMORE AND OHIO RAILROAD BRIDGE OVER YOUGHIOGHENY RIVER TO OAKLAND, MARYLAND.

Oakland, 1½ miles west of; United States Coast Survey bench mark on top of southwest abutment of Baltimore and Ohio Railroad bridge over Youghiogheny River.....	2, 376. 181
Oakland, 1 mile west of; on top of railroad culvert east side of track; marked "X".....	2, 375. 98
Oakland, Baltimore and Ohio Railroad station; top of water table, northwest corner.....	2, 320. 28
Oakland, top of south meridian stone in court-house; copper bolt marked "2461 C".....	2, 461. 031
Oakland, Garrett County court-house; southwest cornerstone; aluminum tablet, marked "2473 C".....	2, 473. 049

OAKLAND TO DEER PARK VIA GORTNER'S MILL, SUNNYSIDE, REDHOUSE, GORMAN, CHISOM'S MILL, AND KEARNEY.

Oakland, 1 mile south of; nail in root of large oak tree, 30 inches in diameter, on west side of road.....	2, 453. 83
Oakland, 2 miles south of; nail in root of blazed lone oak tree, 14 inches in diameter, on east side of road.....	2, 475. 02
Oakland, 3 miles south of; nail in root of blazed cherry tree, on west side of road.....	2, 496. 77
Oakland, 4 miles south of; nail in root of blazed oak tree, 30 inches in diameter, on west side of road.....	2, 468. 41
Gortner's Mill, ½ mile south of; on east side of road at Cherry Creek bridge; nail in root of cherry tree.....	2, 405. 38
Sunnyside, ½ mile north of; nail in root of oak tree, 12 inches in diameter, on west side of road; 150 feet south of road corners.....	2, 518. 20
Sunnyside, ½ mile south of; nail in root of blazed cherry tree, about 30 inches in diameter; about 75 feet east from road corners.....	2, 537. 14
Redhouse, ½ mile north of; nail in notch of stump on west side of road; 100 feet south of house on opposite side.....	2, 512. 81
Redhouse, southwest cornerstone of school building; aluminum tablet, marked "2557 C".....	2, 557. 078
Redhouse, ½ mile east of; nail in root of blazed oak tree, 14 inches in diameter, on east side of road; 100 feet west of first summit east of Redhouse.....	2, 613. 24
Redhouse, 1½ miles east of; chisel mark on boulder east side of road in hollow; 150 yards southeast of Blamble's house.....	2, 603. 26
Redhouse, 2½ miles east of; center of chiseled square on top of rock in place on west side of road.....	3, 004. 48
Redhouse, 2.6 miles east of; four corners on top of Backbone Mountain; boulder about 10 feet south of spring; chiseled square.....	3, 073. 62
Redhouse, 3½ miles southeast of; boulder north side of road; center of chiseled square.....	2, 888. 62

	Feet.
Gorman, 2½ miles west of; top of rock in place on north side of pike, center of chiseled square.....	2,760.22
Gorman, 1½ miles west of; blazed lone oak tree on north side of road; nail in root.....	2,647.78
Gorman; west end of north abutment of highway bridge over Potomac River; aluminum tablet, marked "2312 C".....	2,312.262
Gorman, 1 mile north of; nail in root of blazed oak tree, 24 inches in diameter, just inside of fence on east side of road.....	2,675.87
Chisom's Mill, 0.3 mile west of; chiseled square on top of sharp-topped boulder on east side of road.....	2,670.20
Chisom's Mill, 0.8 mile northeast of; nail in root of maple tree, 30 inches in diameter; east side of road inside of fence.....	2,607.40
Kearney post-office, crossroads at; nail in root of blazed chestnut tree, 24 inches in diameter.....	2,741.62
Kearney, 1 mile northeast of; about 300 feet west of colored schoolhouse; rock in place west side of road, close to wheel track; center of chiseled square.....	2,718.91
Kearney, 2.2 miles northeast of; 900 feet west of Taskers Corners; about 600 feet east southeast from barn in Jerry Tasker's upper field; aluminum tablet, marked "2720 C".....	2,720.246
Kearney, 2.8 miles northeast of; nail in root of blazed white oak tree in front of Kurtz Church; tree about 10 feet from wagon track on west side of road.....	2,596.20
Kearney, 3.8 miles northeast of; center of chiseled square on top of small boulder on east side of road opposite chestnut tree, 24 inches in diameter, and 10 feet south of stump.....	2,806.34
Deer Park, 3 miles south of; on top of Backbone Mountain; center of chiseled square on top of boulder on west side of road close to wagon track; rock lies at north end of long level stretch on top of mountain.....	2,984.23
Deer Park, 2 miles south of; center of chiseled square on top of boulder on east side of road and about 2 feet above roadway.....	2,617.61
Deer Park, between two Baltimore and Ohio stations; surface of southwest wing wall of abutment of stone culvert; 725 feet east of Deer Park hotel station; aluminum tablet, marked "2447 C".....	2,446.956

DEER PARK TO MOUNTAIN LAKE.

Deer Park, 2 miles west of; top of section post 16/17; opposite milepost 228/151.....	2,423.62
Mountain Lake; United States Coast and Geodetic Survey bench mark, described as being 3 miles east of Oakland on top of west abutment of railroad bridge over small stream; this is bridge over Little Youghiogheny River and the point is on the southwest corner of the southwest abutment; marked "2404 C".....	2,404.492

FLINTSTONE ALONG BALTIMORE PIKE TO PRATT POST-OFFICE.

Gilpometown; northeast angle of road to north; spike in telegraph pole...	774.97
Flintstone, 1.5 miles east of; top of milestone No. 122 to Baltimore.....	827.25
Flintstone, 2.5 miles east of; top of milestone No. 121 to Baltimore.....	1,263.89
Flintstone, 2.75 miles east of; top of Polish Mountain opposite telegraph pole; stone marked "1381".....	1,381.749
Flintstone, 3.5 miles east of; top of milestone No. 120 to Baltimore.....	1,166.30
Pratt post-office, ¼ mile east of; bronze tablet in ledge of rock south side of road; 150 feet west of Robinette's old house; marked "938 C".....	937.903
Pratt post-office, 0.4 mile east of; spike in telegraph pole by house north side of pike.....	930.23

TRIANGULATION AND SPIRIT LEVELING.

369

	Feet.
Pratt post-office, 2.25 miles east of; top of milepost No. 117 to Baltimore.	737.48
Pratt post-office, 2.75 miles east of Fifteenmile Creek; spike head in south-east corner of floor beam	728.97
Little Orleans; Chesapeake and Ohio Canal; aqueduct over Fifteenmile Creek; north end east coping; bronze tablet, marked "459 C".....	459.288

HANCOCK, WESTWARD ALONG BALTIMORE PIKE, TO BENCH MARK NEAR HARVEYS.

Chesapeake and Ohio Canal aqueduct; coping stone middle of north wall, same being about 600 feet east of bridge; United States Coast and Geodetic Survey bench mark, marked "1878 F"	420.813
Hancock Bank, front of; bronze tablet on stone doorsill; marked "448 C".	448.122
Hancock, west end of; bridge over Little Tonoloway Creek; south side and east end; bolthead	414.92
Hancock, 1.5 miles west of; at gate of George Corbett's house; nail in root of large walnut tree.....	541.68
Hancock, 2.8 miles west of; bridge over creek; nail in southwest corner of floor	486.27
Hancock, 4.5 miles west of; spike in telegraph pole opposite church.....	661.80
Hancock, 5.15 miles west of; $\frac{1}{4}$ mile east of "Harveys;" 100 feet west of road to Woodmont; bronze tablet in solid rock on south side of pike, marked "946 C"	945.552

HANCOCK TO SLEEPY CREEK STATION, VIA BERKELEY SPRINGS, ROCK GAP, AND STOTTERS CORNERS.

Hancock, Baltimore and Ohio Railroad station; top of north rail, west-bound track	419.94
Hancock, 2 miles southwest of; nail in root of elm tree 15 inches in diameter on west side of road close to blazed and marked sycamore tree.....	598.74
Hancock, 3 miles southwest of; blazed oak tree 30 inches in diameter on west side of road; nail in root	583.54
Berkeley Springs, 2 miles north of; center of chiseled mark on top of boulder on west side of road 150 feet south of brick house.....	655.20
Berkeley Springs, 1 mile north of; center of chiseled square on top of boulder on west side of road, about 50 feet north of Phillip's house....	616.54
Berkeley Springs, Morgan County court-house; west face of southwest corner stone; aluminum tablet, marked "612 C"	611.894
Berkeley Springs, 2 $\frac{1}{2}$ miles south of; nail in root of blazed double maple tree in creek bottom just beyond road forks.....	686.62
Berkeley Springs, 3 miles south of; nail in notch of lone oak tree on west side of road; elevation marked on fence.....	711.27
Berkeley Springs, 4 miles south of; nail in root of oak tree on west side of road close to wheel track, about 75 feet south of stream from the east..	764.76
Rock Gap, 3 miles north of; center of chiseled square on top of small oval boulder on west side of road near small cherry tree, on a summit about 100 feet south of road running east.....	836.78
Rock Gap, 2 miles north of; nail in root of oak tree on east side of road in fence corner.....	885.13
Rock Gap, 1 mile east of; nail in root of small oak tree in hollow; small blazed pine tree stands directly opposite	816.47
Rock Gap Corners; nail in root of black walnut tree in front of Fearnow's house.....	757.81
Rock Gap Corners, 700 feet west of Fearnow's house, 10 feet north of road at summit of gap, in rock; aluminum tablet, marked "761 C".....	760.755
Rock Gap, 1 mile east of; nail in root of blazed maple tree 24 inches in diameter and about 100 feet south of forks of road.....	707.33

	Feet.
Rock Gap, 2 miles east of; nail in root of blazed oak tree on south side of road.....	703.03
Rock Gap, 3 miles east of; center of shoulder chiseled in face of ledge of rock on east side of road, 100 yards south of trail.....	675.31
Stotlers Corners, $\frac{1}{4}$ mile north of; nail in blaze on sycamore, bank of Sleepy Creek at first ford, at forks of road.....	659.30
Stotlers Corners, $\frac{1}{4}$ mile north of, at first ford of Sleepy Creek; ledge of rock east side of road 25 feet north of north entrance to ford, in cleft in rock about 4 feet above roadway; aluminum tablet, marked "662 C".	662.053
Stotler's crossroads, $1\frac{1}{4}$ miles north of; cut in a ledge of shale rock on east side of road and 2 feet above, in a clump of pines; there is a retreat mark cut about 6 inches long under the point.....	648.45
Buck's graveyard, 100 feet north of; nail in root of blazed oak tree 30 inches in diameter, on west side of road.....	690.56
LOCK 50, CHESAPEAKE AND OHIO CANAL, ALONG CHESAPEAKE AND OHIO CANAL TO M'COYS FERRY, THENCE ACROSS AND UP BACK CREEK.	
Lock 50, Chesapeake and Ohio Canal, close to watch house at; cut in top stone on west end of north side.....	404.37
Chesapeake and Ohio Canal, Lock 50, northeast wing; aluminum tablet marked "402 C".....	402.372
McCoys Ferry, West Virginia side; center of chiseled square in rock about midway on and 4 to 5 feet above the trail between Blanchard's house and the river.....	386.34
McCoys Ferry, 1 mile south of; nail in root of blazed pine tree on north side of road, about 500 feet west of summit of gap.....	523.06
Columbus school, 150 yards west of; nail in root of blazed oak tree on north side of road.....	415.31
Donaldsons Ford, $\frac{1}{4}$ mile west of; square shoulder cut in ledge of shale rock on east side of road, 100 feet east of road corners.....	391.07
Johnsontown, 2.6 miles north of; 200 yards south of Bolse's house; nail in root of tree used as gatepost.....	478.57
Johnsontown, Baptist church, $\frac{1}{4}$ mile south of, at four corners; nail in root of oak tree.....	501.08
Johnsontown, Baptist church; top of southwest corner stone in foundation.....	474.13
Johnsontown, 1.2 miles south of; center of chiseled square on an outcrop of sandstone rock about 125 feet east of road forks and $2\frac{1}{4}$ miles west of Hedgesville; three small pines stand just south.....	562.36

NORTH CAROLINA, TENNESSEE, AND GEORGIA.

Precise levels.

ERRATA IN PREVIOUS REPORTS.

As a result of the final closure of the line of precise levels commenced in 1896 at Morehead City, North Carolina, and closed during the last field season by connection with the Coast Survey tide gauge at Brunswick, Georgia, the final adjustment of the closure error of the whole of this line is now possible.

During the last year, through the courtesy of the Superintendent of the United States Coast and Geodetic Survey, observations were continued for six months at Morehead City, North Carolina, to determine a more exact mean sea datum than that on which this leveling has hereto-

fore been based. On January 14, 1899, Mr. E. L. McNair connected the tidal gauge at Morehead City with the United States Geological Survey bench-mark post, between 300 and 400 feet distant. As a result, he found the elevation of this post to be 6.951 feet above mean sea level. He likewise checked the bench mark on the brick house owned by George Dees, in Morehead City, and found its elevation to be 16.951 feet above mean sea level. The elevations of these bench marks were published in the Eighteenth Annual Report of this survey as being respectively 7.763 feet and 17.763 feet above mean sea level. The difference, 0.812 foot, is, therefore, that between the mean sea level at Morehead City now accepted and that accepted at the time of the publication of the report above cited.

At Brunswick, Georgia, mean sea level has been observed at St. Simons light at various times between 1854 and 1898 by the United States Coast and Geodetic Survey. This has been connected through precise levels of the United States Engineers with various bench marks in the city of Brunswick. Closures were made by Mr. McNair's precise levels on all of these bench marks and a discrepancy was found between them ranging between +0.048 foot and -0.296 foot, the mean closure being -0.172 foot, due probably to settlement among them, as they have been set for from eight to ten years.

The datum at Morehead City on which the published elevations in the eighteenth and nineteenth annual reports are based was an assumed mean sea level originally, and was afterwards corrected to mean sea level from the short series of observations made by this Survey in November, 1896. The assumed datum was found at that time to be 0.925 foot too low. In applying this correction to the elevations it was added instead of being subtracted, as it should have been. Accordingly, all elevations heretofore published for this line of precise levels are 1.850 feet too high according to the determination of mean sea level made at that time. Compared with the final determinations of mean sea level made by the United States Coast and Geodetic Survey, the mean sea level adopted in 1896 and 1897 is 1.038 feet too high. Therefore, all elevations from Morehead City to Brunswick are 0.815 foot too high.

The closure errors at Brunswick on the four bench marks of the United States Engineers thus become -1.060 feet, -1.003 feet, -1.108 feet, -0.764 foot, respectively. Number four is not considered, because the bench mark was found to be loose. The mean of the other three gives the mean closure error of this circuit as -1.057 feet. The limit of error allowable in the total distance from Morehead City to Brunswick, 1,043 miles, is, under the formula, $0.03\sqrt{\text{distance in miles}}$, equal to 0.969 foot. The closure made therefore exceeds this by 0.088 foot.

This is the absolute error of closure on two mean sea-level bench marks as determined by two series of tidal observations, and does not take into account the probable error of these. The divergence between

the two duplicate lines which were run throughout this distance, based on the formula $0.03\sqrt{2}$ distance in miles, is shown for each of the important bench-mark stations en route in the following tables. According to it the difference in elevation is everywhere well within this limit of error.

TABLE I.—*Divergence of duplicate precise-level lines between Morehead City, North Carolina, and Atlanta, Georgia.*

Distance from Morehead.	DIVERGENCE.		Distance from Morehead.	DIVERGENCE.	
	Partial.	Total.		Partial.	Total.
<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>
0.02.....			216.13.....	+ .014	0.584
0.94.....	+ .005	0.005	224.20.....	+ .026	0.610
7.19.....	— .004	0.001	228.75.....	+ .002	0.612
13.22.....	+ .024	0.025	234.37.....	+ .040	0.652
20.33.....	.000	0.025	239.30.....	+ .010	0.662
27.26.....	+ .041	0.066	246.26.....	+ .042	0.704
34.41.....	— .015	0.051	253.13.....	— .003	0.701
35.63.....	+ .014	0.065	256.92.....	+ .014	0.715
41.33.....	— .039	0.026	263.88.....	+ .064	0.779
47.46.....	+ .020	0.046	273.60.....	— .016	0.763
52.63.....	+ .039	0.085	281.88.....	+ .115	0.778
59.05.....	— .015	0.070	286.53.....	— .003	0.781
68.59.....	+ .009	0.079	291.41.....	— .012	0.769
74.84.....	+ .037	0.116	298.83.....	+ .003	0.772
80.86.....	— .025	0.091	306.04.....	+ .047	0.819
89.27.....	— .004	0.087	311.51.....	— .005	0.814
94.77.....	+ .004	0.091	315.68.....	— .003	0.801
100.53.....	+ .003	0.094	320.67.....	— .004	0.797
106.44.....	+ .051	0.145	330.37.....	— .002	0.795
114.92.....	+ .075	0.220	336.12.....	+ .036	0.831
120.36.....	+ .007	0.227	340.63.....	— .019	0.812
127.94.....	— .043	0.184	346.64.....	+ .013	0.825
137.24.....	+ .032	0.216	351.21.....	— .003	0.822
143.35.....	+ .060	0.276	357.16.....	+ .015	0.837
151.25.....	— .001	0.275	361.74.....	— .001	0.836
155.90.....	— .056	0.331	367.02.....	+ .013	0.849
162.10.....	+ .034	0.365	372.23.....	— .003	0.846
168.92.....	— .015	0.350	378.11.....	+ .021	0.867
177.72.....	.000	0.350	383.88.....	+ .008	0.875
182.62.....	+ .033	0.383	388.57.....	+ .002	0.877
187.03.....	+ .021	0.404	391.99.....	— .008	0.869
192.51.....	+ .051	0.455	395.37.....	— .044	0.825
200.81.....	— .006	0.449	402.58.....	+ .002	0.827
209.37.....	+ .121	0.570	407.36.....	— .012	0.815

TABLE I.—Divergence of duplicate precise-level lines between Morehead City, North Carolina, and Atlanta, Georgia—Continued.

DIVERGENCE.			DIVERGENCE.		
Distance from Morehead.	Partial.	Total.	Distance from Morehead.	Partial.	Total.
Miles.	Feet.	Feet.	Miles.	Feet.	Feet.
411.64.....	+ .001	0.816	584.46.....	— .039	0.951
413.65.....	+ .008	0.824	592.20.....	— .007	0.944
420.00.....	— .004	0.820	598.34.....	+ .029	0.973
425.22.....	+ .005	0.825	605.85.....	— .019	0.954
430.72.....	— .010	0.815	613.08.....	— .020	0.934
436.25.....	— .003	0.812	619.38.....	— .023	0.911
443.77.....	+ .002	0.814	625.24.....	+ .033	0.944
451.96.....	— .011	0.803	630.55.....	+ .013	0.957
457.05.....	+ .021	0.824	639.67.....	— .014	0.943
462.83.....	— .010	0.814	547.97.....	— .007	0.936
468.12.....	— .020	0.794	652.95.....	+ .017	0.953
474.88.....	+ .003	0.797	658.37.....	+ .016	0.969
479.29.....	— .045	0.752	665.50.....	+ .007	0.976
486.26.....	+ .038	0.790	674.61.....	+ .007	0.983
492.03.....	— .008	0.782	682.68.....	+ .016	0.999
501.62.....	+ .044	0.826	692.04.....	+ .011	1.010
509.62.....	+ .047	0.873	699.20.....	+ .019	0.991
514.22.....	+ .024	0.897	707.28.....	+ .054	1.045
522.93.....	+ .011	0.908	714.62.....	— .034	1.011
530.17.....	+ .023	0.931	721.48.....	— .024	0.987
536.43.....	— .032	0.899	726.16.....	— .026	0.961
543.17.....	— .009	0.890	731.64.....	+ .029	0.990
550.49.....	+ .002	0.892	740.51.....	+ .023	1.013
557.49.....	+ .012	0.914	747.19.....	— .029	0.984
566.43.....	— .006	0.908	754.50.....	+ .003	0.987
571.93.....	+ .021	1.029	758.53.....	+ .015	1.002
577.88.....	— .039	0.990	765.57.....	— .047	0.955

TABLE II.—Divergence of duplicate precise-level lines between Atlanta and Brunswick, Georgia.

Place.	Miles from Morehead.	Elevation, direct line.	Elevation, re- verse line.	Difference.	Limit.
				Feet.	Feet.
Atlanta.....	765.57	1,050.605	1,049.650	0.955	1.174
Constitution.....	771.93	847.042	846.096	0.946	1.179
Ellenwood.....	778.71	848.739	847.813	0.926	1.184
Stockbridge.....	784.82	810.519	809.621	0.898	1.188
McDonough.....	794.12	866.440	865.536	0.904	1.195
Locust Grove.....	801.46	837.176	836.250	0.920	1.201

TABLE II.—*Divergence of duplicate precise-level lines between Atlanta and Brunswick, Georgia—Continued.*

Place.	Miles from Morehead.	Elevation, direct line.	Elevation, re- verse line.	Difference.	Limit.
				<i>Feet.</i>	<i>Feet.</i>
Jenkinsburg	806.31	766.067	765.149	0.918	1.205
Jackson	812.58	727.180	726.275	0.905	1.209
Cork	820.28	546.473	545.557	0.916	1.215
Juliette	830.47	375.879	374.975	0.904	1.223
Dames Ferry	838.12	347.493	346.563	0.930	1.228
Holton	845.41	339.540	338.612	0.928	1.234
Macon	854.09	334.720	333.812	0.908	1.240
Reid	863.37	272.453	271.563	0.890	1.247
Ballards	870.08	259.179	258.295	0.884	1.251
Adams Park	873.99	259.332	258.461	0.871	1.254
Westlake	880.18	234.807	233.931	0.876	1.259
McGriff	886.84	259.170	258.302	0.868	1.263
Cochran	892.75	342.115	341.232	0.883	1.268
Empire	898.29	381.783	380.927	0.856	1.272
Greeston	903.05	400.883	400.033	0.850	1.275
Eastman	911.38	357.270	356.417	0.853	1.280
Godwinsville	916.52	312.012	311.169	0.843	1.284
Chauncey	921.02	299.832	298.990	0.842	1.288
Achord	926.70	275.047	274.216	0.831	1.292
McRae	931.54	229.827	228.999	0.828	1.295
Scotland	936.61	142.254	141.426	0.828	1.298
Towns	941.56	127.972	127.150	0.822	1.302
Lumber City	948.50	145.921	145.107	0.814	1.307
Hazlehurst	955.69	256.061	255.247	0.814	1.311
Graham	961.82	244.306	243.472	0.834	1.316
Pine Grove	965.05	229.517	228.688	0.829	1.318
Baxley	971.63	206.260	205.447	0.813	1.322
Wheaton	975.54	200.830	200.038	0.792	1.325
Surrency	981.11	186.763	185.971	0.792	1.329
Brentwood	986.62	167.012	166.222	0.790	1.333
Odum	992.02	155.106	154.324	0.782	1.336
Jesup	1,001.88	99.755	98.989	0.766	1.343
Gardi	1,008.50	61.581	60.813	0.768	1.347
Pendarvis	1,011.50	85.361	84.596	0.765	1.349
Mount Pleasant ..	1,018.53	55.642	54.896	0.746	1.354
Everett	1,021.20	16.506	15.740	0.766	1.356
Sapps Still	1,028.50	18.408	17.662	0.746	1.361
B. & W. crossing ..	1,035.71	24.796	24.048	0.748	1.365
Brunswick	1,041.99	10.813	10.075	0.738	1.370
Brunswick	1,043.17	7.001	6.251	0.750	1.370

TABLE III.—*Actual divergence for every 50 miles from Morehead City, North Carolina, to Brunswick, Georgia, and divergence allowable under formula .03' $\sqrt{2}$ dist. in miles.*

Distance from Morehead.	DIVERGENCE.		DIVERGENCE ALLOWABLE UNDER FORMULA.	
	Partial.	Total.	Partial.	Total.
<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
50	+ 0.065	0.065	0.300	0.300
100	+ 0.029	0.094	0.300	0.423
150	+ 0.181	0.275	0.300	0.519
200	+ 0.174	0.449	0.300	0.600
250	+ 0.253	0.702	0.300	0.671
300	+ 0.083	0.785	0.300	0.735
350	+ 0.037	0.822	0.300	0.793
400	+ 0.003	0.825	0.300	0.848
450	— 0.022	0.803	0.300	0.900
500	+ 0.007	0.810	0.300	0.949
550	+ 0.082	0.892	0.300	0.995
600	+ 0.073	0.965	0.300	1.039
650	— 0.020	0.945	0.300	1.081
700	+ 0.046	0.991	0.300	1.122
750	— 0.006	0.985	0.300	1.162
800	— 0.065	0.920	0.300	1.201
850	— 0.002	0.918	0.300	1.238
900	— 0.064	0.854	0.300	1.273
950	— 0.040	0.814	0.300	1.308
1,000	— 0.047	0.767	0.300	1.343
1,043	— 0.017	0.750	0.300	1.370

As a result of the closure at Brunswick and the redetermination of mean sea level at Morehead City, an adjustment of the entire line has been made, and the elevations of the various permanent bench marks set throughout this work are published hereafter, as finally adjusted, in the following manner:

1. The datum plane of the elevations published in previous reports has been raised by the constant 0.812 foot to conform to the recent determinations of mean sea level at Morehead City, and this correction has been applied to all the following bench marks.

2. Varying corrections have been applied to eliminate the closure error of 1.057 feet, by which the line was found to be too low at Brunswick, Georgia. These varying corrections have been made in accordance with the following arbitrary weights:

The first 115 miles of the line from Morehead City was run under the most favorable conditions of party personnel, over level ground, and with small divergence. The mean of the results as given by the two lines are accepted without varying correction as practically correct.

Between mile 115 and mile 303 the line was run under unfavorable conditions of thawing and freezing weather, over heavy grades, and not under the most favorable condition in the way of harmonious work among the assistants. The divergence increased rapidly in this stretch. Accordingly, a total of -0.500 foot has been distributed throughout this portion of the line.

From mile 306 to mile 1,043 the conditions were uniform and fairly satisfactory. The remainder of the total error, -0.557 foot, was distributed accordingly throughout this area.

These amounts were uniformly distributed in conformity with the following formula:

$$\sqrt{\text{Total dist.}} : \sqrt{\text{Partial dist.}} :: \text{Total error} : \text{Correction.}$$

The results of this adjustment from Morehead City to Brunswick are given below:

Miles.	Original elevation.	Corrected elevation, —.812	Correction.	Adjusted elevation.	Place.
00	7.763	6.951	00	6.951	Morehead City, N. C.
0.9	17.763	16.951	00	16.951	Do.
7.2	19.356	18.544	00	18.544	Do.
13.2	28.943	28.131	00	28.131	Do.
20.3	27.382	26.570	00	26.570	Do.
27.3	25.801	24.989	00	24.989	Do.
34.4	7.888	7.076	00	7.076	Do.
35.6	15.673	14.861	00	14.861	Newbern, N. C.
41.3	27.334	26.522	00	26.522	Do.
47.5	50.674	49.862	00	49.862	Do.
52.6	47.621	46.809	00	46.809	Cove Creek, N. C.
59.5	63.653	62.841	00	62.841	Dover, N. C.
68.6	48.179	47.367	00	47.367	Kinston, N. C.
74.8	55.231	54.419	00	54.419	Falling Creek, N. C.
80.9	109.207	108.395	00	108.395	Lagrange, N. C.
89.3	119.593	118.781	00	118.781	Do.
94.7	110.991	110.179	00	110.179	Goldboro, N. C.
100.5	135.859	135.047	00	135.047	Rose, N. C.
108.4	151.959	151.147	00	151.147	Princeton, N. C.
114.9	178.131	177.319	00	177.319	Selma, N. C.
120.4	229.218	228.406	.080	228.486	Wilsons Mills, N. C.
127.9	345.638	344.826	.129	344.955	Clayton, N. C.
137.2	383.521	382.709	.169	382.878	Garner, N. C.
143.4	318.650	317.838	.190	318.028	Raleigh, N. C.
151.2	496.588	495.776	.216	495.992	Cary, N. C.
155.9	321.271	320.459	.230	320.689	Do.
162.1	359.974	359.162	.246	359.408	Do.

Miles.	Original elevation.	Corrected elevation, —.812.	Correc- tion.	Adjusted elevation.	Place.
168.9	406.043	405.231	.264	405.495	Durham, N. C.
177.7	471.420	470.608	.274	470.882	University Station, N. C.
177.7	549.279	548.467	.274	548.741	
177.7	502.663	501.851	.274	502.125	Chapel Hill, N. C.
183.1	543.384	542.572	.297	542.869	Hillsboro, N. C.
187.3	666.763	665.951	.303	666.254	Do.
192.5	677.743	676.931	.314	677.245	Mebane, N. C.
200.8	641.972	641.160	.334	641.494	Graham, N. C.
209.4	720.835	720.023	.349	720.372	Gibsonville, N. C.
216.1	744.259	743.447	.361	743.808	McLeansville, N. C.
224.2	839.455	838.643	.376	839.019	Greensboro, N. C.
228.8	813.167	812.355	.384	812.739	Do.
234.4	793.246	792.434	.393	792.827	Jamestown, N. C.
239.3	939.789	938.977	.401	939.378	High Point, N. C.
246.3	851.728	850.916	.412	851.328	Thomasville, N. C.
253.1	665.175	664.363	.423	664.786	Do.
256.9	810.461	809.649	.429	810.078	Lexington, N. C.
263.9	630.186	629.374	.441	629.815	Salisbury, N. C.
273.6	765.103	764.291	.454	764.745	Do.
281.9	670.549	669.737	.465	670.202	Do.
286.5	789.633	788.821	.473	789.294	Cleveland, N. C.
291.4	837.548	836.736	.479	837.215	Elmwood, N. C.
298.8	925.835	925.023	.488	925.511	Statesville, N. C.
306.0	776.092	775.280	.500	775.780	Do.
311.5	872.914	872.102	.546	872.648	Catawba, N. C.
315.7	969.596	968.784	.561	969.345	Claremont, N. C.
320.7	995.832	995.020	.577	995.597	Newton, N. C.
330.4	1,164.119	1,163.307	.600	1,163.907	Hickory, N. C.
336.1	1,086.691	1,085.879	.612	1,086.491	Hildebran, N. C.
340.6	1,192.806	1,191.994	.621	1,192.615	Connelly Springs, N. C.
346.6	1,192.678	1,191.866	.631	1,192.497	Valdise Station, N. C.
351.2	1,181.829	1,181.017	.637	1,181.654	Morganton, N. C.
357.2	1,215.005	1,214.193	.646	1,214.839	Glen Alpine, N. C.
361.7	1,090.615	1,089.803	.653	1,090.456	Bridgewater, N. C.
367.0	1,297.681	1,296.869	.660	1,297.429	Nebo, N. C.
372.2	1,437.934	1,437.122	.666	1,437.788	Marion, N. C.
378.1	1,285.516	1,284.704	.674	1,285.378	Greenlee, N. C.
383.9	1,437.183	1,436.371	.681	1,437.052	Old Fort, N. C.
388.5	1,829.269	1,828.457	.685	1,829.142	Round Knob, N. C.
392.0	2,152.671	2,151.859	.690	2,152.549	Do.
395.4	2,521.771	2,520.959	.693	2,521.652	(Swannanoa Tunnel).
402.6	2,221.500	2,220.688	.701	2,221.389	Swannanoa, N. C.

Miles.	Original elevation.	Corrected elevation, --.812.	Correc- tion.	Adjusted elevation.	Place.
407.4	2,057.079	2,056.267	.705	2,056.972	Azalea, N. C.
411.6	1,995.554	1,994.742	.710	1,995.452	Biltmore, N. C.
413.7	1,985.644	1,984.832	.712	1,985.544	Asheville, N. C.
420.0	1,924.069	1,923.257	.719	1,923.976	Do.
425.2	1,795.668	1,794.856	.724	1,795.580	Alexander, N. C.
430.7	1,729.335	1,728.523	.738	1,729.261	Do.
436.3	1,646.336	1,645.524	.734	1,646.258	Marshall, N. C.
443.8	1,529.551	1,528.739	.740	1,529.479	Barnard, N. C.
452.0	1,326.185	1,325.373	.747	1,326.120	Hot Springs, N. C.
457.0	1,258.617	1,257.805	.752	1,258.557	Do.
462.8	1,184.157	1,183.345	.757	1,184.102	Do.
468.1	1,140.886	1,140.074	.761	1,140.835	Do.
474.9	1,094.511	1,093.699	.766	1,094.465	Bridgeport, N. C.
479.3	1,058.204	1,057.392	.770	1,058.162	Newport, Tenn.
486.3	1,010.028	1,009.216	.775	1,009.991	Rankin, Tenn.
492.0	1,142.302	1,141.490	.780	1,142.270	White Pine, Tenn.
501.6	1,350.985	1,350.173	.787	1,350.960	Morristown, Tenn.
509.6	1,193.066	1,192.254	.793	1,193.047	Talbot, Tenn.
514.2	1,117.833	1,117.021	.796	1,117.817	Do.
522.9	905.182	904.370	.802	905.172	Do.
530.2	864.878	864.066	.807	864.873	Do.
536.4	867.390	866.578	.811	867.389	Do.
543.2	933.299	932.487	.815	933.302	Knoxville, Tenn.
550.5	940.382	939.570	.820	940.390	Do.
557.5	819.915	819.103	.825	819.928	Concord, Tenn.
566.4	799.258	798.446	.830	799.276	Lenoir, Tenn.
571.9	783.815	783.003	.834	783.837	Loudon, Tenn.
577.9	859.780	858.968	.838	859.806	Philadelphia, Tenn.
584.5	918.400	917.588	.842	918.430	Sweetwater, Tenn.
592.2	978.713	977.901	.847	978.748	Mouse Creek, Tenn.
598.4	868.821	868.009	.850	868.859	Athens, Tenn.
605.9	807.298	806.486	.855	807.341	Riceville, Tenn.
613.1	706.396	705.584	.859	706.443	Do.
619.4	798.443	797.631	.863	798.494	Do.
625.0	874.720	873.908	.866	874.774	Cleveland, Tenn.
630.6	895.287	894.475	.870	895.345	Blue Springs, Tenn.
639.7	866.685	865.873	.875	866.748	Cohutta, Tenn.
648.0	794.946	794.134	.879	795.013	Do.
653.0	774.336	773.524	.882	774.406	Dalton, Ga.
658.4	712.185	711.373	.885	712.258	Phelps, Ga.
665.5	718.636	717.824	.888	718.712	Millers, Ga.
674.6	619.834	619.022	.893	619.915	Do.

Miles.	Original elevation.	Corrected elevation, —.812.	Correction.	Adjusted elevation.	Place.
682.7	652.547	651.735	.898	652.633	Pinson, Ga.
682.9	613.406	612.594	.903	613.497	Rome, Ga.
689.2	696.729	695.917	.906	696.823	Do.
707.3	798.723	797.911	.910	798.821	Do.
714.6	763.488	762.676	.915	763.591	Do.
721.7	1,087.787	1,086.975	.918	1,087.893	Do.
726.2	1,014.587	1,013.775	.920	1,014.695	McPherson, Ga.
731.6	1,050.221	1,049.409	.923	1,050.332	Dallas, Ga.
740.5	956.826	956.014	.927	956.941	Do.
747.2	929.821	929.009	.930	929.939	Austell, Ga.
754.5	804.361	803.549	.934	804.483	Do.
758.5	855.003	854.191	.936	855.127	Peyton, Ga.
765.6	1,050.127	1,049.315	.940	1,050.255	Atlanta, Ga.
771.9	847.569	846.757	.943	847.700	Constitution, Ga.
778.7	848.276	847.464	.946	848.410	Ellenwood, Ga.
784.8	810.070	809.258	.949	810.207	Stockbridge, Ga.
794.1	865.938	865.126	.953	866.079	McDonough, Ga.
801.5	836.710	835.898	.956	836.854	Locust Grove, Ga.
806.3	765.608	764.796	.958	765.754	Jenkinsburg, Ga.
812.6	726.728	725.916	.959	726.875	Jackson, Ga.
820.3	546.015	543.203	.965	544.168	Cork, Ga.
830.5	375.437	374.615	.970	375.585	Juliette, Ga.
838.1	347.028	346.216	.973	346.189	Dames Ferry, Ga.
845.4	339.076	338.264	.976	339.240	Holton, Ga.
854.1	334.266	333.454	.980	334.434	Macon, Ga.
863.4	272.008	271.196	.984	272.180	Reid, Ga.
870.1	258.737	257.925	.987	258.912	Bullard, Ga.
874.0	258.897	258.085	.988	259.073	Adams Park, Ga.
880.2	234.369	233.557	.991	234.548	Westlake, Ga.
886.8	258.736	257.924	.994	258.918	Do.
892.8	341.673	340.861	.997	341.858	Cochran, Ga.
898.3	381.355	380.543	.999	381.542	Empire, Ga.
903.0	400.458	399.646	1.001	400.645	Greaston, Ga.
911.4	356.843	356.031	1.004	357.035	Eastman, Ga.
916.5	311.591	310.779	1.006	311.785	Godwinsville, Ga.
921.0	299.411	298.599	1.009	299.608	Chauncey, Ga.
926.7	274.632	273.820	1.011	274.831	Achord, Ga.
931.5	229.413	228.601	1.012	229.613	McRae, Ga.
936.6	141.840	141.028	1.015	142.043	Scotland, Ga.
941.6	127.561	126.749	1.017	127.766	Towns, Ga.
948.5	145.514	144.702	1.019	145.721	Lumber City, Ga.
955.7	255.654	254.842	1.022	255.864	Hazlehurst, Ga.

Miles.	Original elevation.	Corrected elevation, —.812	Correction.	Adjusted elevation.	Place.
961.8	243.889	243.077	1.025	244.102	Graham, Ga.
965.0	229.102	228.290	1.026	229.316	Pine Grove, Ga.
971.6	205.853	205.041	1.029	206.070	Baxley, Ga.
975.5	200.434	199.622	1.030	200.652	Wheaton, Ga.
981.1	186.367	185.555	1.032	186.587	Surrency, Ga.
986.6	166.617	165.805	1.035	166.840	Brentwood, Ga.
992.0	154.715	153.903	1.037	154.940	Odum, Ga.
1,001.9	99.372	98.560	1.041	99.601	Jesup, Ga.
1,008.5	61.197	60.385	1.043	61.428	Gardi, Ga.
1,011.5	84.979	84.167	1.044	85.211	Pendavis, Ga.
1,018.5	55.269	54.457	1.047	55.504	Mount Pleasant, Ga.
1,021.2	16.123	15.311	1.048	16.359	Everett, Ga.
1,028.5	18.035	17.223	1.050	18.273	Sapps Still, Ga.
1,035.7	24.422	23.610	1.054	24.664	Brunswick, Ga.
1,042.0	10.444	9.632	1.056	10.688	Do.
1,043.2	7.414	6.602	1.057	7.659	Do.
1,043.2	8.381	7.569	1.057	8.626	Do.
1,043.2	6.626	5.814	1.057	6.871	Do.

GEORGIA.

Precise levels.

FULTON, CLAYTON, HENRY, BUTLER, MONROE, BIBB, TWIGGS, PULASKI,
DODGE, TELFAIR, APPLING, WAYNE, AND GLYNN COUNTIES.

ATLANTA, GRIFFIN, MONTICELLO, MACON, EASTMAN, M'RAE, LUMBER CITY, BAXLEY,
JESUP, AND BRUNSWICK QUADRANGLES.

The elevations published in the following list were determined during the continuation of the precise levels run in 1896 and 1897 from Morehead City, North Carolina, via Asheville, North Carolina, and Knoxville, Tennessee, to Atlanta, Georgia. They are therefore based on the same tablet at Morehead City, as has been heretofore described. All tablets set in the course of this work are marked with the letters "MOREHEAD" and the figures "1898," in addition to the figures of elevation.

The leveling was done by Mr. E. L. McNair, levelman, assisted by Messrs. J. E. Buford and W. F. Hammond, rodmen, and was executed with the same instruments and rods and by the same methods as has heretofore been described for this line of precise levels.

TRIANGULATION AND SPIRIT LEVELING.

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SOUTHERN RAILWAY: ATLANTA TO BRUNSWICK, GEORGIA.

	Feet.
South Atlanta; top of south rail at road crossing.....	1,016.11
Constitution; 4 feet southeast of station signpost; 25 feet south of railroad; iron post, marked "847 MOREHEAD, 1898".....	847.700
Norton; top of south rail opposite signpost.....	815.83
Henrico; top of south rail at signpost.....	862.79
Conley; top of south rail.....	850.35
Ellenwood; 2 feet northwest of station platform; 20 feet south of track; iron post, marked "848 MOREHEAD, 1898".....	848.410
Estes; top of west rail opposite signboard.....	782.10
Stockbridge, brick post-office building; 18 feet left of front doorway, 2½ feet above ground; aluminum tablet, marked "810 MOREHEAD, 1898".....	810.207
Tunis, road crossing at; west rail.....	782.74
Flippin; west rail opposite station.....	860.75
McDonough; Henry County court-house; granite footstone of stone arch at right of main entrance to; aluminum tablet, marked "866 MOREHEAD, 1898".....	866.079
McDonough; top of west rail opposite station.....	860.67
Locust Grove; 55 feet north of railroad station; 25 feet west of main track; 3 feet north of small black oak tree 4 inches in diameter; iron post, marked "837 MOREHEAD, 1898".....	836.854
Jenkinsburg; 25 feet west of Southern Railway station; 20 feet south of track; iron post, marked "766 MOREHEAD, 1898".....	765.754
Jackson; west rail opposite station.....	697.15
Jackson; Butts County court-house; in sandstone just above water table at right of front entrance to; aluminum tablet, marked "727 MOREHEAD, 1898".....	726.875
Florilla; west rail at station.....	588.43
Cork; 10 feet south of station platform; iron post, marked "546 MOREHEAD, 1898".....	544.168
Berner; west rail opposite station.....	394.26
Juliette; 88 feet south of railroad station; 15 feet west of center of track; 3 feet south of milepost 217; iron post, marked "375 MOREHEAD, 1898".....	375.585
Dames Ferry; 3 feet north of station, 23 feet west of center of main track; iron post, marked "347 MOREHEAD, 1898".....	346.189
Popes; west rail at station.....	348.73
Holton; 35 feet north of station, 29 feet west of center of track; iron post, marked "339 MOREHEAD, 1898".....	339.240
Virgin; top of west rail at road crossing.....	328.93
Virgin, 0.9 mile south of; west rail at milepost 236.....	310.07
Macon; United States post-office building at corner of Mulberry and Third streets; in water table at left of Mulberry street entrance; aluminum tablet, marked "334 MOREHEAD, 1898".....	334.434
Macon, 0.7 mile south of; at crossing Central Railway of Georgia and Southern Railway; top of west rail of Southern Railway.....	310.80
Reid; opposite signboard at; 40 feet southwest of center of main track; iron post, marked "272 MOREHEAD, 1898".....	272.180
Bullard; 2 feet south of south end of platform, 35 east of center of main track; iron post, marked "259 MOREHEAD, 1898".....	258.912
Adams Park; 3½ feet south of platform, 19 feet east of center of track; iron post, marked "259 MOREHEAD, 1898".....	259.073
Westlake; 2½ feet south of station platform, 33 feet east of center of main track; iron post, marked "234 MOREHEAD, 1898".....	234.548
McGriff; 4½ feet south of pump house, 12½ feet west of center of track; iron post, marked "259 MOREHEAD, 1898".....	258.918
Longstreet; west rail opposite station.....	301.86

	Feet.
Cochran; 55 feet west of station platform, 33 feet west of center of main track, 3 feet north of large telegraph pole; iron post, marked "342 MOREHEAD, 1898"	341.858
Empire; 50 feet north of station platform, 13 feet west of center of main track, 4 feet south of post marked "STOP;" iron post, marked "381 MOREHED, 1898"	381.542
Gresston; 36 feet west of southwest corner of station; 17 feet west of center of track; iron post, marked "400 MOREHED, 1898"	400.645
Eastman; 37 feet north of station, 38 feet west of center of track; iron post, marked "357 MOREHED, 1898"	357.035
Godwinsville; 15 feet north of station, 20½ feet west of center of main track; iron post, marked "312 MOREHED, 1898"	311.785
Chauncey; 2 feet east of station platform, 47 feet north of center of main track; iron post, marked "300 MOREHED, 1898"	299.608
Misler; west rail at station	293.02
Cox; west rail at station	287.09
Achord; south rail opposite signboard	274.44
Achord; opposite signboard near west end of siding; 100 feet south of southwest corner of store, 28 feet south of center of main track; iron post, marked "275 MOREHED, 1898"	274.831
Helena; crossing of Southern Railway and Georgia and Alabama Railway; south rail of Southern Railway	246.85
McRae; Southern Railway station, 8 feet east of platform; 1 foot east of telegraph pole and 32 feet south of center of main track; iron post, marked "229 MOREHED, 1898"	229.613
Scotland; Southern Railway station; 8 inches east of east edge of platform, 35 feet south of center of main track; iron post, marked "142 MOREHED, 1898"	142.043
Towns; Southern Railway station; 39 feet south of center of platform; 34 feet south of center of main track; iron post, marked "128 MOREHED, 1898"	127.766
Lumber City; Southern Railway station, 200 feet east of; 52 feet north of center of main track; 26 feet southwest of corner of barber shop; 3½ feet west of chinaberry tree; iron post, marked "146 MOREHED, 1898"	145.721
Hazlehurst; Southern Railway station; 2 feet east of platform; 30½ feet south of center of main track; iron post, marked "256 MOREHED, 1898"	255.864
Graham; Southern Railway station; 9½ feet west of building; 26 feet south of center of main track; 2½ feet north of telegraph pole; iron post, marked "244 MOREHED, 1898"	244.102
Pine Grove; Southern Railway station; 39 feet east of road crossing; 47 feet east of freight platform; 16 feet south of center of main track, between two posts holding sign "Pine Grove;" iron post, marked "229 MOREHED, 1898"	229.316
Baxley; Southern Railway station; 67 feet east of end of building; 37 feet south of center of main track; 4 feet west of telegraph pole; iron post, marked "206 MOREHED, 1898"	206.070
Wheaton; Southern Railway station; 57 feet northeast of northeast corner of freight platform; 44 feet south of corner of shanty; 33 feet north of center of main track; iron post, marked "200 MOREHED, 1898"	200.652
Surrency; Southern Railway station; 45 feet south of platform of; 37 feet south of center of main track; iron post, marked "187 MOREHED, 1898"	186.587
Brentwood; Southern Railway station; 54 feet east of freight building and platform; 36 feet north of center of main track; 45 feet south of store; iron post, marked "167 MOREHED, 1898"	166.840

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Odum; Southern Railway station; 78 feet west of platform of; 25½ feet south of center of main track; 43½ feet north of porch of L. Carter & Bro.'s warehouse; iron post, marked "155 MOREHEAD, 1898".....	154.940
Jesup; Southern Railway station (also Savannah, Florida and Western Railway station); 2½ feet southwest of; 33 feet northwest of center of main track of Savannah, Florida and Western Railway; iron post, marked "99 MOREHEAD, 1898"	99.601
Gardi; Southern Railway station; 2½ feet from southeast corner of; 39 feet northeast of center of main track; iron post, marked "61 MOREHEAD, 1898"	61.428
Pendawis Siding; between posts holding signboard at; 850 feet south of head block at north end of siding; 22 feet northeast of center of main track; 174 feet south of corner of dwelling house; iron post, marked "85 MOREHEAD, 1898"	85.211
Mount Pleasant; Southern Railway station, 95 feet northwest of; 42 feet southwest of center of main track; iron post, marked "55 MOREHEAD, 1899"	55.504
Everett; Southern Railway station; 29 feet west of; 11½ feet west of center of main track; 109½ feet northwest of center of crossing of Southern Railway and Florida Central and Peninsular Railroad; 2½ feet northwest of telegraph pole; iron post, marked "16 MOREHEAD, 1899"	16.359
Sapp Still (Pennick post-office); 160 feet north of head block at south end of siding; 24 feet east of center of main track; between posts supporting signboard; iron post, marked "18 MOREHEAD, 1899"	18.273
Sterling; Southern Railway station; west rail opposite	20.71
Dock Junction, 2 miles north of; at crossing of Southern Railway and Brunswick and Western Railroad; 22 feet northeast of center of Brunswick and Western track, and 23½ feet east of center of Southern track; iron post, marked "24 MOREHEAD, 1899"	24.664
Brunswick; city hall building at southwest corner of intersection of Newcastle and Mansfield streets, in foundation wall at right of Newcastle street entrance; aluminum tablet, marked "10 MOREHEAD, 1899".	10.688
Brunswick; Glauber & Isaacs warehouse near McCullough's wharf; large spike in oak stump under hole made through floor (Engineer Corps elevation 7.662)	7.659
Brunswick; Glauber & Isaacs warehouse; 80 feet south of; 12 feet west of office building; on spike in notch in southwest side of live-oak tree 20 inches in diameter (Engineer Corps elevation 8.572)	8.626
Brunswick, McCullough's wharf; 20 feet back from and 16 feet from south edge of ballast pile; top of coupling of 1½-inch gas pipe driven in ground, now about 15 inches above ground surface (Engineer Corps elevation 6.922)	6.871
Brunswick, northeast corner of P and Oglethorpe streets; top of iron pipe 1 foot below surface of sidewalk, 1 foot from fence on line of Oglethorpe street; bricks to be removed (Engineer Corps elevation 14.432)	14.725

NORTH CAROLINA.

ERRATA IN PREVIOUS REPORTS.

The elevations heretofore published for the State of North Carolina, in the Appendixes to the Eighteenth and Nineteenth Annual Reports, pages 301 and 243, respectively, should be changed by fixed amounts, as stated in the preceding note relative to precise levels. Those pub-

lished in the Eighteenth Annual Report were based on a bench mark set in the Biltmore office building, the elevation of which was accepted as 1,995.544 feet above mean sea level. The final adjustment of the precise levels (p. —) makes this elevation 1,995.452 feet, which is now accepted as its height; therefore all the elevations published in the Eighteenth Annual Report are to be corrected by subtracting from them the constant 0.102 foot.

Those elevations which were published in the Appendix to the Nineteenth Annual Report were based on a bronze tablet set in the train shed at Asheville, and marked "1986," the elevation of which was accepted as 1,985.650 feet above mean sea level. In accordance with the preceding note on precise levels, the finally adjusted elevation of this bench mark is now accepted as being 1,985.544 feet; therefore all elevations published in the Nineteenth Annual Report dependent on this bench mark must be reduced by the constant quantity 0.106 foot.

BUNCOMBE, MADISON, AND HAYWOOD COUNTIES.

ASHEVILLE QUADRANGLE.

The elevations published in the following list are based on various bench marks connected with the line of precise levels run over the line of the Southern Railway through this area. As stated in the preceding note on precise levels, the elevations of these bench marks have been changed because of the final adjustment by various amounts. The bench marks published herewith have been reduced in accordance with this final adjustment, and are therefore to be accepted as final elevations.

The leveling was done under the general direction of Mr. W. L. Miller, topographer, by Mr. W. S. D. Moore, levelman.

All bench marks set during the season are marked with the letters "ASH," in addition to the figures of elevation, thus referring them to the central datum tablet placed in the post-office building in the city of Asheville.

	Feet.
Asheville; Federal building; aluminum tablet set in wall on east side of southern entrance to post-office, marked "2210 ASH"	2, 208. 437

ALEXANDER TO SANDY MUSH, VIA LEICESTER.

Alexander, 310 feet west of station, 11.1 feet north of north rail of main track; copper bolt in stone, marked "1796 ASH"	1, 795. 550
Alexander, 1 mile southwest of; chisel mark on stone 20 feet south of road; 200 feet east of house, on south of wall; marked "1910 ASH" ...	1, 910. 124
Alexander, 1.5 miles southwest of; nail in root of pine tree 100 feet north of fork of road	2, 046. 26
Sluder, Charles, house of; nail in root of walnut tree in front of	2, 068. 60
Alexander, 3.9 miles southwest of; nail in root of post oak tree near top of hill	2, 216. 58
Alexander, 5.2 miles southwest of; nail in root of post oak tree at crossing of roads	2, 207. 71

	Feet.
Leicester, $\frac{1}{2}$ mile west of, at road forks; northeast to Alexander and west to Sandy Mush; aluminum bolt set in stone north side of road, marked "2106 ASH".....	2, 106. 052
Brick schoolhouse, 500 feet west of; nail in root of pine tree at road fork.	2, 165. 41
Leicester, 2 miles west of, 300 feet east of Mr. Reynolds's residence; aluminum bolt set in stone in fork of road, marked "2157 ASH".....	2, 156. 525
Sandy Mush, 500 feet east of Union Church; in stone, 10 feet north of center of road; aluminum bolt, marked "2251 ASH".....	2, 251. 022

TUSCOLA TO CRABTREE.

Tuscola, 500 feet east of post-office, 10 feet south of public road; iron post, marked "2595 A".....	2, 594. 878
Richland Creek, water surface.....	2, 511. 4
Tuscola, 1.55 miles north of; nail in root of white oak tree near top of hill.....	2, 606. 57
Pigeon River ford, 100 feet north of right bank; nail in root of black gum tree.....	2, 487. 66
Tuscola, 3.88 miles north of; chiseled cross (+) on stone north of road, marked "2480".....	2, 479. 93
Pigeon River, bridge over; southwest corner of pier at east end; chiseled cross (+).....	2, 487. 64
Tuscola, 5.93 miles north of; red oak tree south side of road; nail in root.	2, 676. 31
Crabtree post-office; nail in root of locust tree in front of blacksmith shop.	2, 482. 31
Crabtree, 1.3 miles east of, at junction with road east and west; nail in root of red oak tree, north of road, 300 feet east of top of hill.....	2, 636. 45
Crabtree, 2.78 miles east of, 525 feet east of fork of road and brick church, in boulder 10 feet north of center of road; aluminum bolt, marked "2610 A".....	2, 610. 086

CRABTREE TO FINES CREEK.

Crabtree post-office, 1 mile southwest of, 8 feet west of center of road and 10 feet northeast of north bank of Pigeon River, 300 feet west of mouth of Crabtree Creek; iron post marked "2452 A".....	2, 451. 977
Tuscola, 10.5 miles north of; linn tree at water's edge, east bank of Pigeon River; nail in stump of.....	2, 403. 55
Tuscola, 10.3 miles north of, opposite blacksmith shop on north side of branch; 15 feet west of center of road and 15 feet east of large chestnut tree; chisel mark on stone.....	2, 578. 75
Palm post-office, 500 feet east of, 50 feet west of Fines Creek; chisel mark in stone 5 feet south of center of road.....	2, 420. 44
Fines Creek post-office, $\frac{1}{2}$ mile west of, at road fork; nail in root of white oak tree on west side of road.....	2, 526. 20
Fines Creek post-office, 50 feet north of, 20 feet south of center of road; iron post marked "2601 A".....	2, 601. 519
Fines Creek post office, 1.53 miles east of, 1 mile west of top of mountain, on boulder north of road in front of house; chiseled cross (+).....	3, 435. 03

ALEXANDER TO MARS HILL, VIA JUPITER.

Alexander, 1.01 miles northeast of; highway bridge over Flat Creek; west end of south abutment; chisel mark.....	1, 771. 82
Alexander, 2.4 miles northeast of, at road forks; stone, west side of road; chisel mark.....	1, 849. 53
Alexander, $4\frac{1}{2}$ miles northeast of, $2\frac{1}{2}$ miles south of Jupiter, in fork of road; iron post, set 3 feet in ground, marked "2133 A".....	2, 132. 746

	Feet.
Jupiter, white oak tree in front of church; nail in root.....	2, 159. 30
Big Ivy River, 20 feet north of right bank, $\frac{1}{2}$ mile below Eller Pond and 200 feet above mouth of White Oak Branch; aluminum bolt, set in stone, marked "1848 A".....	1, 848. 376
Mars Hill, $\frac{1}{2}$ mile northeast of, 10 feet west of center of road; iron post marked "2417 A".....	2, 416. 603

MARSHALL TO WALNUT RUN POST-OFFICE.

Marshall, Madison County court-house; bronze tablet, set in wall at southeast corner of building, marked "1646 A".....	1, 646. 258
Marshall, 4.38 miles north of; nail in stump, west edge of road.....	2, 072. 09
Marshall, 5.26 miles north of, and $\frac{1}{2}$ mile north of Walnut Run post-office, $\frac{1}{2}$ mile south of fork of road; stone, 10 feet west of center of road and 350 feet north of dwelling on same side of road; aluminum bolt, marked "2143 A".....	2, 143. 060

BARNARD TO SHELTON LAUREL CREEK, VIA DUEL HILL AND WHITE ROCK.

Barnard, 0.2 mile west of station, 140 feet west of milepost No. 171, 65 feet north of north rail of main track; in solid rock; copper bolt marked "1529 A".....	1, 529. 479
Barnard, 1.69 miles north of; fork of roads at Duel Hill; nail in root of tree.....	1, 959. 01
Barnard, 4.5 miles north of; 20 feet north of branch flowing southwest; chestnut tree 15 feet west of road; nail in root.....	2, 221. 34
Barnard, 4.9 miles north of; at fork of road in gap of mountain; nail in root of white oak tree.....	2, 308. 19
Barnard, 7.02 miles north of; in gap of mountain; nail in root of black oak stump, north side of road.....	2, 516. 76
Barnard, 9.07 miles north of; at ford of Big Laurel Creek; nail in root of hackberry tree, west bank.....	1, 757. 72
Barnard, 9.75 miles north of; at junction with road from Big Laurel post-office to White Rock post-office; chisel mark on stone.....	1, 910. 14
Barnard, 11.3 miles north of; opposite church and schoolhouse; nail in root of chestnut oak, east side of road.....	2, 162. 46
White Rock post-office, 1 mile southwest of; 150 feet northeast of ford of Shelton Laurel Creek, in stone 15 feet north of road; aluminum bolt marked "1793 A".....	1, 793. 028

FROM $2\frac{1}{2}$ MILES SOUTH OF WHITE ROCK EASTWARD ALONG BIG LAUREL CREEK TO POINT 2 MILES WEST OF LITTLE CREEK POST-OFFICE.

White Rock post-office, $2\frac{1}{2}$ miles south of; chisel mark on stone at fork of roads.....	1, 910. 17
Big Laurel post-office, 1,000 feet west of; 70 feet north of Spillecorn Creek, in rock 6 feet north of center of road; aluminum bolt marked "2004 A".....	2, 103. 723
Little Creek postoffice, 9.65 miles west of; 50 feet northeast of ford of Big Laurel Creek, on bowlder on north bank; chisel mark.....	1, 956. 21
Little Creek, 4.4 miles west of; at road forks, north bank of creek; nail in root of red oak tree.....	2, 414. 05
North Carolina Lumber Company's splash dam, 300 feet west of; north bank of creek; nail in root of sycamore tree.....	2, 339. 32
Little Creek post-office, 2 miles west of; 20 feet south of center of road, 50 feet south of Big Laurel Creek; in bowlder 5 by 7 by 4 feet; aluminum bolt marked "2636 A".....	2, 636. 161

HOT SPRINGS TO SPRING CREEK, VIA BLUFF AND LEE.

Hot Springs, southeast corner of east abutment of Spring Creek bridge; copper bolt, marked "1326 A".....	1, 326. 120
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	Feet.
Hot Springs, 2.5 miles south of, at top of hill; 5 feet south of road; nail in root of white pine stump.....	1,656.68
Hot Springs, 3.6 miles south of, on top of spur of mountain; nail in root of chestnut tree north of road.....	1,850.05
Hot Springs, 4.2 miles south of, on point of mountain; nail in root of maple tree 10 feet east of road.....	2,111.17
Bluff post-office, $\frac{1}{4}$ mile east of; chisel mark on stone 5 feet north of road, 50 feet east of fork of roads.....	1,895.37
Bluff post-office, 1.53 miles south of, on point of ridge; near church on west side of road; nail in root of apple tree east side of road.....	2,964.09
Lee, 1.49 miles south of, opposite church in gap of mountain; nail in root of white pine tree 15 feet west of road.....	2,350.34
Lee, 2.18 miles south of, $\frac{1}{4}$ mile north of road forks, 500 feet northeast of ford of Spring Creek, in sandstone 10 feet southeast of center of road; aluminum bolt, marked "2237 A".....	2,236.912
Spring Creek post-office, $2\frac{1}{4}$ miles south of; 50 feet south of fork of roads; in stone 10 feet west of center of road; aluminum bolt, marked "2473 A".	2,473.452

BLUFF POST-OFFICE TO ROARING FORK CREEK.

Bluff post-office, $\frac{1}{4}$ mile east of, 150 feet east of fork of roads; chisel mark on stone 5 feet north of road.....	1,895.37
Bluff post-office, $\frac{1}{4}$ mile west of; in fork of roads; nail in root of white pine tree.....	2,093.41
Bluff post-office, 6.3 miles west of, and 1.34 miles west of mouth of Roaring Fork Creek, 20 feet west of ford and 15 feet north of north bank of Roaring Fork Creek; in stone 10 feet west of center of road; aluminum bolt, marked "2766 A".....	2,765.566

GEORGIA AND ALABAMA.

Errata in previous reports.

FLOYD, CHATTOOGA, AND POLK COUNTIES, GEORGIA; AND CHEROKEE COUNTY, ALABAMA.

ROME AND FORT PAYNE QUADRANGLES.

The result of the final adjustment of the precise levels run during 1897 and 1898 has been to change the accepted elevation of the initial datum at Rome, Georgia. That datum was found to be 14.063 feet too high, and in consequence this value must be subtracted from all elevations published in the Eighteenth Annual Report, Part I, under the title "Georgia and Alabama," bottom of page 317 to bottom of page 323. Bench marks established in the course of this leveling are marked approximately 14 feet too high, and they may be known by their bearing either no datum letter or the letter "R."

ALABAMA.

DEKALB, CHEROKEE, ETOWAH, CALHOUN, CLEBURNE, AND TALLADEGA COUNTIES.

FORT PAYNE AND ANNISTON QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the Union Station at Anniston, Alabama, and marked "A 710." The height of this is accepted as 709.902 feet above mean sea level, as deter-

mined by the precise levels of this Survey from Morehead City, North Carolina, to Brunswick, Georgia, via Knoxville, Rome, and Atlanta. Many of the bench marks established in these two quadrangles, as well as those established in the field season of 1896 in the Rome quadrangle, were based on an approximate railway height assumed for Rome (see Appendix to Eighteenth Annual Report), and either marked without index letter or the letter "R." The markings on these are approximately 14 feet too high, as that was the difference found between the Rome datum and its actual height by precise levels. All of the elevations published hereafter have been reduced by this difference, which was exactly 14.063 feet, and are therefore referred to adjusted mean sea level, although the bench marks have in numerous cases been marked with the letter "R" and referred to Rome datum. Those marked "A" are on the Anniston corrected datum.

The leveling done in connection with the work of the season of 1897 was executed under the direction of Messrs. A. M. Walker and J. W. Thom, topographers, by Messrs. Thomas S. Maldin, Walter R. Harper, and Hargraves Wood, levelmen. That done during the field season of 1898 was executed under the direction of Messrs. J. W. Thom and W. C. Hall, topographers, by Mr. W. S. D. Moore, levelman.

KEY TO CENTER, VIA BOMAR AND MOSHAT.

	Feet.
Key, $\frac{1}{4}$ mile east of, 150 feet west of Weldon Sneed's house; large oak tree, north side of road; nail in root (648.34 of Eighteenth Annual Report, p. 321)	634.28
Key post-office, about $\frac{1}{4}$ mile west of; nail in root of small oak about 15 feet south of road at top of hill west of branch, blazed and marked "651"	636.50
D. E. Harris's house, church in front of; nail in root of oak bearing sign "Abnathy's Mills $2\frac{1}{4}$ miles;" blazed "657"	643.25
Center, about $7\frac{1}{4}$ miles east of; nail on root of small black gum tree about 25 feet south of road and 1 mile west of church. Blazed and marked "601"	587.38
Cowan Creek, at north of road at ford of; nail in root of oak about 25 feet east of creek on north edge of road	558.43
Bomar, about $\frac{1}{4}$ mile west of; nail on top of stump in hollow, marked "589"	577.65
Cowan Creek, $1\frac{1}{4}$ miles west of; nail in root of small oak about 10 feet north of road and 100 feet east of dwelling at top of hill, blazed and marked "721"	707.02
Moshat; in yard of dwelling house at fork of roads; iron post, marked "R 677"	663.177
Moshat crossroads, about 1 mile west of, $\frac{1}{4}$ mile west of 4-mile post; nail in root of large oak on south edge of road, blazed and marked "696"....	682.108
Center, about $2\frac{1}{4}$ miles east of; nail in root of small oak on west edge of road about 75 feet north of dwelling on east side at top of hill, blazed and marked "701"	687.33
Center, $1\frac{1}{4}$ miles east of; $\frac{1}{4}$ mile west of forks of road; 25 feet south of road, in hollow; small sweet gum tree, blazed and marked "648;" nail in root	634.122
Center, 1 mile east of, at fork of road; tree, north side of road, bearing sign "Piedmont 18 miles;" blazed and marked "628;" nail in root....	613.92

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Center, marked point on masonry wing on east side of front steps of court-house at	663. 46
Center, in front of court-house at; copper tablet in sill of hall window east of doorway, marked "R 680"	666. 039

CENTER TO LEESBURG.

Center, 1½ miles west of, about 500 feet east of branch; nail on root of large hickory on south edge of road; blazed and marked "591"	577. 69
Center, 2½ miles west of, and about 350 feet west of bridge in swamp; nail in root of large twin oak on line of fence north of road; blazed and marked "559"	544. 85
Center, about 3½ miles west of; nail in root of small oak on north edge of road; blazed and marked "575"	560. 92
Center, 3½ miles west of, about 700 feet east of fork of road to Tripps Ferry; oak tree, north edge of road, blazed and marked "581;" nail in root	566. 67
Tripps Ferry, west bank of Coosa River; maple tree, east edge of bend in road, blazed and marked "558;" nail in root	544. 00
Leesburg, 1,000 feet east of station; large oak tree, blazed and marked "558," in crossroads; nail in root	581. 62

LEESBURG TO GADSDEN.

Leesburg, 1,000 feet east of post-office, in northeast corner of crossroads, 1,000 feet south of railroad; iron post, marked "596 R"	582. 314
Leesburg, 1 mile southwest of, on road to Gadsden; nail in large oak in fork of road to northwest	585. 96
Leesburg, 2 miles west of; nail in root of gum tree in front of J. F. Hale's house	574. 44
Leesburg, 3 miles west of; nail in root of oak tree on southerly side of road to Gadsden at fork made by road from Keener crossroads	587. 19
Leesburg and Gadsden, road between, at junction with road to Huffs Gap; nail in root of oak tree on northerly side of road	581. 66
Cherokee and Etowah counties, line between; nail in oak tree westerly side of road between Leesburg and Gadsden	574. 72
Blunta Creek, 195 feet southwest of; nail in root of walnut tree westerly side of road between Leesburg and Gadsden	525. 81
Gadsden, 350 feet east of 11-mile sign; stone on road between Leesburg and Gadsden opposite small house on northerly side of road	557. 85
Oak Hill, 165 feet west of Penticost's house at; top of iron bench-mark post set by United States Geological Survey at Oak Hill at foot of large oak tree at southerly side of road between Leesburg and Gadsden, marked "R 601"	586. 506
Gadsden, 10 miles southeast of; nail in root of oak tree on easterly side of road between Leesburg and Gadsden	578. 81
Turkey Town Creek, 200 feet southwest of; nail in root of large oak tree on southeasterly side of road to Gadsden	539. 23
Gadsden, 7 miles northeast of; nail in root of tree on northerly side of road between Leesburg and Gadsden in front of John Steadman's house	552. 90
Rome and Decatur Railroad, crossing near 51-mile post of; nail in root of oak tree 36 feet north of road and 83 feet west of track	577. 69
Anderson's gin, ¼ mile southeast of; nail in root of tree at highway crossing on Rome and Decatur Railroad	567. 20
Anderson's gin, 400 feet southwest of; iron post set by United States Geological Survey at fork in road between Leesburg and Gadsden, marked "R 587"	573. 173

	Feet.
Gadsden, 2½ miles northeast of; about 100 feet south of the crossing of the Rome and Decatur Railroad; nail in root of oak tree on westerly side of road running southerly from the road between Leesburg and Gadsden	550. 33
Gadsden station, on Rome and Decatur Railroad; northwest side of main track opposite west end of Rome and Decatur station; nail in stake on northwest side of main track	519. 49
GADSDEN TO KEENER, VIA EAST GADSDEN, LOOKOUT MOUNTAIN, AND ALABAMA GREAT SOUTHERN RAILROAD.	
Gadsden, Etowah County court-house; southwest corner of foundation, Broad street front; bronze tablet marked "R 569"	554. 844
Elliott Car Works; nail in whistle post on Rome and Decatur Railroad opposite water tank	551. 25
Elliott Car Works, west of; 60 feet west of crossing of Rome and Decatur Railroad; nail in root of oak tree	553. 80
Gadsden, 2½ miles north of; nail in root of hickory tree on northerly side of road between Gadsden and Keener, at top of gap	754. 43
Black Creek Falls; square cut on ledge 60 feet east of Black Creek at bridge on road between Gadsden and Keener, near Falls	690. 22
Gadsden, 4 miles northeast of; nail in root of large pine on easterly side of road between Gadsden and Keener, near 4-mile sign from Gadsden ...	778. 03
Gadsden, 4½ miles east of; square cut on ledge on northerly side of road between Gadsden and Keener	805. 31
Gadsden, 6½ miles northeast of; 6 feet west of a small stream crossing and 230 feet east of house on northerly side of road; square cut on ledge on northerly side of road	866. 57
Moon Spring Branch, 7 miles northeast of Gadsden at; 300 feet west of 7-mile post from Gadsden; cut on ledge on northerly side of road between Gadsden and Keener	901. 26
Moon Spring Branch, 70 feet west of; 370 feet west of 7-mile post from Gadsden; copper bolt in ledge on northerly side of road, marked "A 893"	893. 025
Tucker Gap, foot of; road from Tucker Gap to Valley road to Keener; nail in root of gum tree 150 feet north of creek and on easterly side of road	592. 34
Chattanooga, 75 feet east of 79-mile post and 375 feet east of westerly section house of Alabama Great Southern Railroad; square cut on cap stone of southerly side of culvert under the Alabama Great Southern Railroad	625. 50
Chattanooga, 180 feet west of 78-mile post from; Alabama Great Southern Railroad; top of iron rail set endwise in ground on southerly side of track at tangent point	633. 99
Chattanooga, 30 feet west of the 77-mile post from; middle post of support to extra rail on northerly side of the Alabama Great Southern Railroad	654. 17
Chattanooga, 15 feet west of the 76-mile post; nail in easterly post of support to extra rail on northerly side of the Alabama Great Southern Railroad track	661. 73
Chattanooga, 10 feet west of 75-mile post from; nail in easterly post of support for extra rail on northerly side of the Alabama Great Southern Railroad track	666. 44
Keener, 800 feet west of; top stone of culvert under the Alabama Great Southern Railroad	667. 74
Keener, 15 feet east of J. P. Keener's store; iron post at, marked "A 675".	675. 109

TRIANGULATION AND SPIRIT LEVELING.

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KEENER TO COLLINSVILLE, ALONG ALABAMA GREAT SOUTHERN RAILROAD.

	Feet.
Chattanooga, 10 feet west of 74-mile post from; nail in top of easterly post of extra rail support on northerly side of Alabama Great Southern Railroad.....	681.52
Chattanooga, 10 feet west of 73-mile post from; nail in easterly post of extra rail support on northerly side of Alabama Great Southern Railroad track.....	695.32
Chattanooga, 10 feet west of 72-mile post; nail in top of easterly post supporting extra rail on northerly side of Alabama Great Southern Railroad track.....	708.47
Chattanooga, 15 feet west of 71-mile post from; nail in post used to support extra rail on northwest side of Alabama Great Southern Railroad.....	730.62
Chattanooga, 50 feet southwest of 70-mile post from; nail in post used to support extra rail on westerly side of Alabama Great South Railroad....	754.92
Chattanooga, 30 feet east of 69-mile post from; chalk on top of easterly stone of southerly abutment.....	792.60
Chattanooga, at 65-mile post from, on the Alabama Great Southern Railroad; nail in post used to support extra rail on north side of track.....	728.49
Collinsville station, 120 feet east of crossing at; nail in top of broken telegraph pole on north side of Alabama Great Southern Railroad track....	717.06
Collinsville, Methodist church; 4 feet south of the southeast corner of building; iron post marked "708 A"	708.347

COLLINSVILLE TO LEEsburg, VIA SAND ROCK AND LACKEY GAP.

Lackey Gap; Alabama Great Southern Railroad, highway crossing near foot of; top of easterly stone of north side of culvert.....	801.02
Lackey Gap, $\frac{1}{4}$ mile west of summit; nail in root of oak tree, blazed and marked "1343," east side of road.....	1,329.43
Yellow Creek, steel bridge over, on main road between Lackey Gap and Sand Rock; rivet on top of southerly steel column of westerly abutment of bridge	864.33
Sand Rock; oak tree blazed and marked "931," southwest corner of crossroads at post-office; nail in root.....	916.42
Center, 9 miles northwest of, on road between Sand Rock and Leesburg; chestnut tree 140 feet south of mile board, east side of road; nail in root 18 inches from tree.....	887.53
Ewing Gap, foot of; 115 feet south of crossing of Chattanooga Southern Railroad; black gum tree east side of road; nail in root.....	658.72

CEDAR BLUFF TO PORTERVILLE VIA FIRESTONE, TUCKER, LACKEY GAP, AND ALABAMA GREAT SOUTHERN RAILROAD.

Cedar Bluff; public square; 3 feet west of large oak tree; iron post, marked "608" (elevation 607.990 feet of 1896, see Appendix to Eighteenth Annual Report, p. 320)	593.927
Cedar Bluff and Gaylesville, road between; $\frac{1}{4}$ mile northeast of bridge over Chattooga River; oak tree at road junction; nail in root.....	568.45
Cedar Bluff and Hurley, road between; 1,200 feet east of Horton's house and near gate across road; nail in root of pine tree west side of road ..	601.42
Cedar Bluff and Hurley, road between; $\frac{1}{4}$ mile north of gate near fork at Horton's house; nail in root of blazed maple tree east side of road.....	675.83
Hurley, 7 feet east of spring at post-office; 60 feet south of ford of Spring Creek; copper bolt, in ledge on east side of road, marked "U.S.G.S. 581 R"	566.732
Hurley, 600 feet west of post-office; church or schoolhouse; highest point of lowest stone doorstep	602.29

	Feet.
Firestone, south end of bridge over little river; in northeast corner of roads; iron post, marked "603 R"	588.878
Firestone, 1½ miles west of, on road to Starling Gap; pine tree, north side of road, blazed and marked "637;" nail in root	622.81
Starling Gap; road fork just west of summit; oak tree, blazed and marked "884;" nail in root	870.16
Tucker, 500 feet north of post-office, at fork of road to Porterville and Fort Payne; iron post, marked "1161 R"	1,140.146
Tucker, 1 mile northwest of; nail in stump of small oak 250 feet west of crossroad	1,161.75
Tucker and Collinsville road, 1 mile west of church and schoolhouse at crossroads 2½ miles east of Porterville; oak tree, south side of road, blazed and marked "1267;" nail in root	1,252.76
Tucker and Collinsville road, 1½ miles west of church and schoolhouse at crossroads 2½ miles east of Porterville; nail in large oak stump, north side of road	1,375.80
Porterville, 500 feet northeast of station; Alabama Great Southern Railroad bridge No. 28, over small stream flowing northwest; west side of south abutment; copper bolt, marked "759 A"	758.895

COLLINSVILLE, VIA COKER GAP DOWN BIG WILLS CREEK TO SETTLEMENT ROAD.

	Feet.
Collinsville and Coker Gap road, 400 feet south of junction of, with Fort Payne road; nail in root of tree bearing sign "Fort Payne 16 miles"...	678.99
Collinsville and Big Wills road; ¼ mile beyond last bench mark; nail in root of tree on south side of road	680.69
Big Wills Creek, about 3½ miles southwest of Collinsville; rivet on bed plate on top southerly pier at westerly end of steel bridge over Big Wills Creek	653.66
Collinsville, about 6 miles southwest of; iron post at fork made by Settlement road and the Big Wills Valley road to Fort Payne, marked "A 651"	650.422

COLLINSVILLE TO GUEST, VIA DAWSON AND FLOY.

Collinsville, 2½ miles north of; southerly side of Big Wills Creek at south end of steel bridge; nail in root of walnut tree	673.53
Dawson, about 3 miles east of; nail in root of oak tree on northerly side of road between Collinsville and Dawson, 40 feet east of T. F. Myer's house	744.25
Coker Gap, foot of; tree bearing sign "Collinsville 5 miles;" tree near fork made by roads to Dawson and Rodentown, and 100 feet south of Lee Wallace's house; nail in root of large oak tree on easterly side of road	725.90
Coker Gap, ¾ mile south of Dawson; nail in root of oak tree 6 feet east of easterly line of road to Dawson	902.54
Dawson; nail in root of pine tree on southerly side of road at Dawson, opposite blacksmith shop near top of Coker Gap; tree blazed	1,159.51
Dawson, opposite blacksmith shop at; iron bench-mark post set by United States Geological Survey on southerly side of road at top of Coker Gap, marked "A 1160"	1,160.188
Dawson; nail in stump on northerly side of road about 700 feet east of road to Nicholson's Gap and near small cabin	1,149.32
Dawson, 1 mile north of, on road between Dawson and Fort Payne; at M. A. Leak's house; nail in hickory tree on southeast side of road; tree blazed	1,173.72
Dawson, 2½ miles north of; nail in root of large oak post west edge of road between Dawson and Fort Payne; tree blazed "1181"	1,180.63

	Feet.
Johns's sawmill; nail in root of oak tree 40 feet southeast of northerly end of gate; tree blazed	1, 182. 99
Floy, $\frac{1}{4}$ mile southeast of; 250 feet north of small stream crossing; oak tree south side of road; nail in root	1, 151. 00
Floy, east side of road opposite post-office; tree, blazed and marked "1206;" nail in root	1, 206. 23
Floy, north side of road in front of W. H. Elrod's house; iron post, marked "1209 A"	1, 209. 312
Floy, 3 miles northeast of; crossroad to Lebanon and Chavies; tree, blazed and marked "1256;" nail in root	1, 255. 80
Rock Creek Ford; chiseled square in ledge on northeasterly side of road about 15 feet north of ford	1, 113. 03
Guest; J. E. Phillip's house; nail in root of small oak tree near, on east side of road opposite small wood road	1, 187. 13

GUEST TO LUTTRELL.

Guest, 725 feet southeast of; covered bridge over Town Creek; oak tree, blazed and marked, on northeast side of road just west of Wood's sawmill; nail in root	1, 149. 14
Guest, $1\frac{1}{4}$ miles northwest of covered bridge over Town Creek at Wood's sawmill; fork of road to south; oak tree, blazed and marked, on northeast side of road; nail in root	1, 264. 17
Luttrell; south side of road 30 feet east of and 48 feet north of J. O. White's new house at signboard "Lebanon 10 miles;" iron post, marked "1294 A"	1, 293. 624

GUEST TO BOOTSVILLE GAP, VIA LYDIA AND CHAVIES.

Lydia, southeast side of road at post-office; oak tree, blazed and marked; nail in root	1, 229. 26
Lydia post-office, about $\frac{1}{4}$ mile from; square on ledge on southerly side of road between Flag and Chavies, 60 feet east of small brook in the woods	1, 198. 74
Nigger Creek, about 30 feet north of; square cut on ledge on easterly side of road between Flag post-office and Chavies	1, 185. 26
Chavies, about $\frac{1}{4}$ mile southwest of; nail in root of large oak tree on southerly side of road between Flag post-office and Chavies at a private road going in a northeasterly direction through the woods	1, 276. 76
Bootsville Gap, 1 mile north of, and 150 feet northwest of small house or shed in front of J. M. Stafford's residence; nail in root of oak tree on southerly side of road between Chavies and Bootsville Gap	1, 257. 94
Chavies; copper bolt in ledge on westerly side of road at ford in Town Creek at Chavies; bolt is 50 feet north of James Durham's gin and 40 feet west of the highway, marked "1161 A"	1, 160. 436
Bootsville Gap, 300 yards from the top of; nail in root or stump of small oak on easterly side of road. (Nail is bent; elevation is on the angle and not on the head of nail)	1, 219. 45

FORT PAYNE TO BROOMTOWN, VIA RAILROAD GAP, LOOKOUT MOUNTAIN, AND BLANCHE.

Big Wills Creek, 200 feet north of bridge over; cedar tree, blazed and marked "808," on east side of road; nail in root	807. 73
Fort Payne, northeast corner of Gould avenue and Main street; top of hydrant	895. 47
Fort Payne, Dekalb County court-house; north side of east entrance to building; countersunk in stone coping; aluminum tablet, marked "934 A"	923. 821

	Feet.
Fort Payne, 1 mile north of; Alabama Great Southern Railroad crossing; top of rail	944.54
Fort Payne, $1\frac{1}{4}$ miles northeast of; 210 feet southwest of road, in field southeast of Alabama Great Southern Railroad; aluminum bolt, set in limestone ledge, marked "949 A"	938.79
Railroad Gap, 100 feet west of cut at summit of Lookout Mountain; nail in root of sourwood tree in forks of road.....	1,451.18
Fort Payne, 7 miles east of, 40 feet east of Yellow Creek, and 12 feet north of bridge over same; aluminum bolt, set in sandstone ledge, marked "1240 A"	1,229.470
Little River; iron bridge known as "Hill's bridge;" south side of ledge east end of bridge; chiseled square	1,208.05
Blanche, $\frac{1}{4}$ mile southeast of, on road to Broomtown; 10 feet north of center of road; in slate ledge; aluminum bolt, marked "760 A"	749.16
Blanche, 2 miles northeast of, 150 feet east of Chattanooga road; nail in root of red oak tree	824.43
Broomtown, southwest corner of crossroads; iron post, marked "693" (elevation 693.233 of 1896; see Eighteenth Annual Report, p. 320).....	679.179

BLANCHE TO FIRESTONE.

Taff, 600 feet east of, 60 feet south of crossroads; nail in root of red oak tree	742.5
Firestone, west end of bridge over Little River; iron post, marked "603 R"	588.878

CENTER TO BALL FLAT.

Center court-house, $\frac{1}{4}$ mile from; nail in root of large old pine stump on west edge of road	623.70
Center, 1 mile east of; at crossing of road to Garrett; large oak tree, bearing sign marked "668;" nail in root	654.24
Center, $1\frac{1}{4}$ miles south of; nail in root of large double oak tree on east edge of road about 100 feet north of gate across road, blazed and marked "593"	579.16
Terrapin Creek, about 200 yards north of bridge across; nail in root of maple tree in fork of roads just north of branch, blazed and marked "543"	528.62
Center, about 3 miles south of; nail in root of small water oak in fork of roads to Gadsden and Jacksonville, blazed and marked "558"	544.23
Center, about $4\frac{1}{4}$ miles south of; nail in root of large oak about 10 feet west of road at top of small hill, blazed and marked "573"	559.18
Jacksonville and Spring Garden, at fork of roads to; nail in root of oak tree bearing sign "Center 5 miles," blazed and marked "579"	565.29
"Center 6 miles;" nail in root of large white oak tree about 7 feet west of road, bearing sign; blazed and marked "615"	601.15
Center, 7 miles south of, 110 feet south of tree bearing sign "7 miles to Center;" oak tree, east side of road, blazed and marked "666;" nail in root	651.96
Center, about $7\frac{1}{4}$ miles south of; nail in root of tree in northeast corner of crossroads, blazed and marked "622"	608.06
Center, about $7\frac{1}{4}$ miles south of; iron post in northeast corner of crossroads, marked "R 622"	608.375
Center, about $8\frac{1}{4}$ miles south of; nail in root of large post oak tree on east edge of road at top of small hill, blazed and marked "636"	621.50
Center, $8\frac{1}{4}$ miles south of, 200 yards south of dwelling of F. M. Bradley; tree in fork of road, blazed and marked "657;" nail in root.....	642.95

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Center, 9 miles south of; nail in root of tree bearing signboard, west side of road, blazed and marked "630"	616. 24
Center, about 500 feet south of 10-mile sign from; nail in root of small oak on west edge of road at top of hill, blazed and marked "666"	652. 10
Center, 10.5 miles south of; 65 feet south of corner of schoolhouse; large oak tree west side of road, blazed and marked "636;" nail in root	622. 29
Center, 650 feet south of 11 milepost from; nail in root of small oak about 5 feet west of road, blazed and marked "627"	612. 67
Ball Flat; large oak tree, blazed and marked "633," on west side of road opposite barn at post-office; nail in root	618. 72
Ball Flat post-office, about $\frac{1}{4}$ mile south of; nail in root of oak tree on east edge of road, blazed	614. 66

BOMAR TO SPRING GARDEN, VIA SANDFORD SPRING.

Cowans Creek, $\frac{1}{4}$ mile south of bridge across; about 650 feet north of first dwelling; blazed and marked "592"	577. 65
Cowans Creek, about 2 miles south of bridge across; nail in root of large oak on west edge of road, 725 feet north of Camp's dwelling; blazed and marked "598"	583. 85
Cowans Creek, about 3 miles south of bridge across; nail in root of maple tree about 15 feet west of road and about 300 feet north of dwelling on east of road; blazed and marked "622"	608. 13
Rock Run road, about 40 feet north of crossing of; nail on root of small white oak on east edge of road	641. 66
Sandford Spring, 15 feet west of road to, and 100 feet south of road to Coloma, in front of dwelling at fork; nail in root of oak blazed and marked "698"	684. 20
Sandford Spring, $\frac{1}{4}$ mile north of; nail in root of large pine on east edge of road, about 200 feet south of top of hill	752. 72
Sandford's dwelling, by hog pen at; nail in root of persimmon tree on west edge of road	630. 27
Sandford Spring, hill above; iron post east of road, between two large oak trees, about 100 yards south of cabin west of road; marked "R 697"	682. 771
Sandford Spring to Spring Garden; 300 feet south of Casey's house, stone east side of road to	634. 284
Spring Garden road, $\frac{1}{4}$ mile south of crossing on Hurricane Creek; nail in root of a black-oak tree on a side road to St. John's house	623. 48
Spring Garden, 1 mile north of; nail in root of live-oak tree northeast side of road, 200 feet south of Pleasant Gap road	644. 57
Old Spring Garden, west side Gadsden road, near forks of road at; nail in root of large oak tree bearing sign "To Gadsden."	673. 90

SPRING GARDEN TO DAILEY, VIA LADIGA.

Spring Garden, 120 feet north of station and 30 feet east of railroad; iron post, marked "716 R"	702. 098
Spring Garden, about $1\frac{1}{4}$ miles west of; near signboard marked "to Center, 18 miles;" nail in root of small black oak on northwest corner	687. 71
Spring Garden, Piedmont, and Center roads	664. 54
Ladiga, Southern Railway crossing east of; bolthead 11, east end of trestle. Terrapin, $\frac{1}{4}$ mile north of crossing at; nail in root of oak west side of road from Ladiga to Wilson's Ridge, near top of ridge and 150 feet south of fork of road. (Adjusted.)	695. 95
Dailey, $2\frac{1}{4}$ miles north of; schoolhouse at crossroads; nail in root of small oak tree southwest road corner	714. 63

	Feet.
Dailey, 1 mile north of; mark on stone at root of blazed-oak tree west side of road, 200 feet south of gate.....	703.49
Dailey (Wilson's Ridge station, Southern Railway); 15 feet north of water tank; 20 feet west of east and west railroad; iron post, marked "729 R".	714.32

DAILEY TO JACKSONVILLE, VIA GRANTLEY AND JENKINS.

Little Terrapin and Cedartown roads, 150 feet west of fork of; nail in root of oak on the north side of road	744.62
Little Terrapin Creek, east side of road up; nail in root of large white oak bearing sign "To Edwardsville 19 miles."	740.07
Little Terrapin Creek, top of hill; nail in root of persimmon tree bearing sign "To Edwardsville 18 miles," on east side of road	815.97
Edwardsville and Jacksonville road, $\frac{1}{4}$ mile north fork of; nail in root of large hackberry tree on west side Little Terrapin Creek road.....	764.13
Edwardsville, $\frac{1}{4}$ mile west of road to; nail in root of large oak south side of road to Jacksonville and 16 $\frac{1}{4}$ miles east of same.....	931.67
Jacksonville, 250 feet southeast of 16-mile sign to; nail in root of small black oak north side of road, near top of ridge.....	1002.69
Jacksonville, about 15 $\frac{1}{4}$ miles east of, and 150 feet west of trail coming from north; nail in root of hickory tree on northwest side of road to Grantley and Jacksonville.....	1008.01
Jacksonville, 200 feet west of 14-mile sign to; nail in root of white oak on north side of Grantley and Jacksonville road	957.05
Jacksonville, 13 $\frac{1}{4}$ miles east of; nail in root of small beech tree on north side of road to Grantley and Jacksonville.....	896.24
Jacksonville, 12 $\frac{1}{4}$ miles east of; nail in root of oak tree on south side of Grantley and Jacksonville road and 200 feet west of crossing of Dry Creek	840.53
Jacksonville, nearly 12 miles east of; nail in root of oak sapling south side of Grantley and Jacksonville road, near top of ridge	941.96
Jacksonville, 11 $\frac{1}{4}$ miles north of; nail in root of small white oak north side of Grantley and Jacksonville road	861.52
Jacksonville, 10 $\frac{1}{4}$ miles north of; nail in root of small chestnut-oak tree on north side of Grantley and Jacksonville road	857.01
Jacksonville, about 9 $\frac{1}{4}$ miles east of; nail in root of large white oak on north side of road to Grantley and Jacksonville, nearly opposite house at top of ridge	829.33
Jacksonville, nearly 9 miles east of; nail in root of large oak tree on north side of Grantley and Jacksonville road.....	774.07
Jacksonville, nearly 8 miles east of; nail in root of persimmon tree in hollow west of first house east of Rabbittown church	790.35
Jenkins, about 1 mile east of; nail in root of white oak on north side of Grantley and Jacksonville road, nearly opposite road from south at second house west of Rabbittown Church.....	810.40
Jenkins, $\frac{1}{4}$ mile east of; nail in root of large oak 7 miles east of Jacksonville, on north side of Grantley and Jacksonville road, between W. M. Whiteside's house and wagon shed	825.10
Jenkins post-office, 200 feet west of; about 6 $\frac{1}{4}$ miles east of Jacksonville; United States Geological Survey bolt in ledge of rock on north side of Jenkins and Jacksonville road, 100 feet west from White Plains road, marked "R 805"	790.444
Jenkins, $\frac{1}{4}$ mile west of; nail in root of oak on north side of Jenkins and Jacksonville road, opposite cabin at top of ridge	909.10
Jenkins, about 1 $\frac{1}{4}$ miles west of; nail in root of mulberry tree on north-east corner of road and lane at crossing of Cottaguilla Creek	765.40

TRIANGULATION AND SPIRIT LEVELING

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	Feet.
Jacksonville, 4½-mile sign from, and 10-mile sign from Piedmont; nail in root of hickory on northwest corner of road.....	899.42
Jacksonville, 4½ miles east of; nail in root of oak tree on northeast corner forks of road at foot of mountain.....	985.36
Jacksonville, about 4½ miles east of; nail in root of black gum tree on southeast side of Jenkins and Jacksonville road over Whites Gap, between old bark mill and first creek crossing west of mountain.....	1,064.28
White Plains, Anniston and Jacksonville crossroads, nearly ½ mile east of; nail in root of black oak on south side of road of Whites Gap to Jacksonville and 500 feet west of ore mines	856.35
Jacksonville, 3 miles southeast of; nail in root of persimmon tree 70 feet north of church at Anniston and Whites Gap road and Jacksonville and White Plains road	835.89
Jacksonville, about 2 miles east of, on White Plains road; nail in root of hickory tree in front of A. Rutledge's house	830.60
Williams Branch, crossing of; forks of Jacksonville, White Plains, and Anniston roads; nail in root of large oak near.....	668.06
Jacksonville, court-house at; United States Geological Survey plate in east pilaster front of, marked "734 R"	719.886

JACKSONVILLE TO ALLSUPS, VIA TALLASAHATCHEE.

Jacksonville, top of east rail of Southern Railway, opposite station sign at.	628.25
Jacksonville court-house, about ¼ mile north of; nail in root of oak side Center road, at top of hill.....	727.91
Jacksonville, 2-mile sign from; nail in root of oak tree on east side of Jacksonville and Center road	638.80
Jacksonville, 3-mile sign from; nail in root of oak on Center road	655.43
Maxwell's distillery, bridge over Tallasahatchee River; 50 feet east of bridge; nail in root of large ash	613.81
Tallasahatchee, about ¼ mile north of crossing at; nail in root of oak on west side of Center and Jacksonville road	646.87
Goshen, 8-mile sign from; Center, 23-mile sign from; nail in root of oak on northwest corner of forks road near	646.49
Center, 22-mile sign from; northwest corner Jacksonville and Center roads and Gays Ferry and East and West Junction road; nail in root of oak tree bearing sign.....	651.46
Adams Ferry, road Jacksonville to Allsups, opposite fork to; nail in root of oak on east side of road.....	671.36
Jacksonville, about 7½ miles north of; nail in root of oak tree on east side of road Jacksonville to Allsups, near top of ridge.....	796.00
Jacksonville, 8 miles north of; nail in root of sweet-gum tree southwest corner Allsups and Sulphur Springs road	739.03
Jacksonville, 8½ miles north of, and 250 feet north of road to Piedmont; nail in root of chestnut oak on west side of road Jacksonville to Allsups.	742.15
Allsups, United States Geological Survey post at; west side of Center road, about 75 feet north of mill, marked "R 684"	670.05

ALLSUPS TO SPRING GARDEN, VIA GOSHEN.

Goshen to Allsups, road from; opposite large spring 400 feet west of forks of road at sign "21 miles to Gadsden;" nail in root of large oak on south side of road	659.39
Allsups, about 2½ miles southeast of; nail in root of walnut on the south side of Goshen and Allsups road, near forks of road and uncompleted church	713.09

	Feet.
Gadsden, near 23-mile sign to; nail in root of white oak on west side of Goshen and Allsups road, at bend, near small blacksmith shop.....	850.60
Piedmont, 3-mile sign from; nail in root of white oak on southwest corner of Goshen and Allsups road and Piedmont, same bearing sign	728.49
Goshen, 1 mile west of; nail in root of elm tree on west side of road Goshen to Allsups, 400 feet north of forks of road, at cotton gin.....	671.31
Goshen, south of Spring Garden road at; nail in root of oak on west side of Allsups road	716.41
Spring Garden and Goshen road, north side of; nearly $\frac{1}{4}$ mile west Shady Grove Church and 300 feet northeast Harrison Rutherford's house; bolt in ledge of slate.....	661.09
Spring Garden to Goshen, road from; near west end Shady Grove Church; nail in root of oak on north side of road	643.46
Terrapin Creek, 200 feet east of crossing at; nail in root of small live oak on south side of road from Spring Garden to Goshen	644.76
Spring Garden to Goshen, 20 feet south of road from; near Piedmont cross-road; nail in root of small oak growing against pine tree	718.69
JENKINS, DOWN NANCY CREEK TO PIEDMONT, VIA LADIGA.	
Jenkins, $\frac{1}{4}$ mile west of; nail in root of oak on north side of Jenkins and Jacksonville road, opposite cabin at top of ridge.....	909.16
Nancy Creek road; $1\frac{1}{2}$ miles northeast of Jenkins and Jacksonville road, front of second house northeast of same; nail in root of oak on west side of road	880.50
Nancy Creek road; about $2\frac{1}{4}$ miles northeast of Jenkins and Jacksonville road, near small frame house; nail in root of small oak on west side of road.....	798.31
Jacksonville, $9\frac{1}{4}$ -mile sign from and $6\frac{1}{4}$ -mile sign from Piedmont; iron post at southwest corner Nancy Creek and Jacksonville roads, near sign, marked "R 780".....	764.66
Piedmont, $5\frac{1}{4}$ miles southwest of; nail in root of oak on east side of Nancy Creek road, 200 feet northeast road to cotton gin.....	762.97
Piedmont, about 4 miles southwest of; nail in root of large oak on east side of Nancy Creek road, near small bridge at cotton-gin road.....	715.78
Piedmont, $1\frac{1}{2}$ miles southwest of; nail in root of red oak on west side of Nancy Creek road.....	693.99
Piedmont station, top of north rail Southern Railway.....	700.86
Piedmont, Daily's store at; marked point on step.....	704.18
Piedmont, bronze tablet in front of brickwork, Eubanks & Chenny's general store at; marked "R 721".....	705.433
Southern Railway trestle over Nancy Creek, near road crossing; top of post 34.4 north, at northeast end.....	670.33
ADELIA TO READ, VIA MACKS.	
Caves Ferry road, 20 feet west of; in field north side old settlement road; iron post 300 feet north deserted house formerly Adelia post-office, marked "R 766".....	752.055
Adelia, 1 mile southwest of; 200 feet west of top of ridge; nail in root of oak on south side of old road.....	781.24
Jacksonville, about $6\frac{1}{4}$ miles north of; nail in root of small oak on south side of Jacksonville and Hokes Bluff road.....	796.83
Gadsden, 16 miles to; to Alexandria $11\frac{1}{4}$ miles; to Jacksonville $7\frac{1}{4}$ miles; opposite schoolhouse; nail in root of oak at southeast angle of cross-roads	715.54

TRIANGULATION AND SPIRIT LEVELING.

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	Fect.
Jacksonville, 1 mile southwest of Hokes Bluff; about 6½ miles north of Alexandria; nail in root of oak on north side of Alexandria road, west of trail.....	734. 81
Jacksonville, 7-mile sign from, and Piedmont 16 miles; opposite sign to Gadsden 16 miles on Jacksonville and Gadsden road and Alexandria road; nail in root of pine at crossroads bearing sign.....	717. 15
Alexandria, about 8½ miles north of; nail in root of red oak on west side of road.....	711. 49
Alexandria, 8 miles north of; nail in root of black-gum tree on east side of road.....	675. 36
Mack post-office, 1½ miles east of; nail in root of oak tree at southeast corner of forks of Jacksonville, Gadsden, and Alexandria roads; 6 miles north of Alexandria and 6 miles to Jacksonville.....	586. 08
Mack post-office, about ¼ mile east of; nail in root of red-oak treesoutheast corner Jacksonville, Gadsden, and Anniston roads.....	582. 79
Mack post-office; south side of Jacksonville and Gadsden road and 100 feet east of Hokes Bluff road; iron post opposite post-office, marked "R 623".	608. 942
Mack post-office, about 1 mile west of; about 1 mile east of Read; 100 feet west of blacksmith shop; nail in root of oak tree.....	565. 81
Read station, about 300 feet south of bridge over Ohatchee Creek near; nail in root of elm tree on west side of road 50 feet east of Louisville and Nashville Railroad and 100 feet north fork of Anniston and Jacksonville roads.....	535. 60

READ TO HOKES BLUFF.

Read; Louisville and Nashville Railroad crossing; top of rail.....	540. 3
Colvin; crossing just east of station; top of rail.....	642. 1
Colvin, ¼ mile north of; nail in root of small oak east side of road to Rock Springs.....	639. 56
Rock Springs, 20 feet south of post-office; 100 feet south of spring, and about 200 feet east of Louisville and Nashville Railroad; copper bolt in rock west side quarry road, marked "R 594".....	579. 789
Little Cove Creek, south side Hokes Bluff road up; point on cattle guard on Louisville and Nashville Railroad.....	576. 15
Glencoe station; east side of railroad and north side of Hokes Bluff road, near sign to Hokes Bluff 5 miles; top fence corner post.....	551. 51
Glencoe, ¼ mile northeast of; nail in root of small oak tree on northwest side of road from Glencoe to Hokes Bluff, at top of ridge.....	614. 24
Hokes Bluff, 3¼ miles south of; nail in root of small black oak at northeast corner of road from Glencoe to Hokes Bluff, at crossroad.....	575. 06
Hokes Bluff, 2½ miles from; nail in root of oak tree northwest corner of road from Glencoe to Hokes Bluff and road Gadsden to Jacksonville, opposite signboard to Jacksonville 18 miles, to Hokes Bluff 2½ miles, to Gadsden 7 miles.....	566. 25
Hokes Bluff, 1 mile south of; 200 feet south fork Glencoe and Gadsden roads and 800 feet north of crossing of Big Cove Creek; iron post on west side of road from Glencoe to Hokes Bluff, marked "R 562".....	547. 562

HOKES BLUFF TO RICKS.

Hokes Bluff, about ¼ mile from; nail in root of small oak on crossroads; blazed and marked "600".....	585. 85
Gadsden, 100 yards east of 10-mile post from; nail in root of hickory tree on south edge of road in front of dwelling; blazed and marked "618".....	603. 84

	Feet.
Hokes Bluff, $1\frac{1}{2}$ miles north of; nail on root of water oak on north edge of road just east of dry creek about 20 yards west of church; blazed and marked "553"	538.89
Baskens Ferry, about 200 yards east of fork of road to; nail on root of oak tree on south edge of road; blazed and marked "626"	612.26
Gadsden, at 12-mile post from; nail on root of oak on east edge of road at dwelling on top of hill; blazed and marked "601"	586.92
Big Dry Creek, about 200 yards west of; nail in root of white-oak tree on north edge of road; blazed and marked "533"	519.15
Ball Play Creek, $2\frac{1}{4}$ miles south of; 100 yards north of crossroad on top of hill; oak tree, blazed and marked "571," on west edge of road; nail in root	557.32
Gadsden, 14 miles from; about 200 yards north of Little Dry Creek; nail in root of oak tree on east edge of road; blazed and marked "540"	526.19
Center, 14 miles southwest of; 300 feet east of forks of road to Crofts Ferry; oak tree, blazed and marked "608," on bank on north side of road; nail in root	594.04
Adams Ferry, nail in root of small sapling in fork of road to	545.01
Center, about $12\frac{1}{2}$ miles southwest of; nail on root of large sweet-gum tree on north edge of road 375 feet west of gate to ginney; blazed and marked "555"	540.96
Center, 11 miles southwest of; in front of schoolhouse; large oak tree, blazed and marked "577," 20 feet north of road; nail in root	562.66
Center, 10 miles southwest of; at road forks and crossing 120 yards west of mileboard, 5 feet from large oak tree; iron post, marked "591 R"	576.634
Center, 10 miles southwest of; 120 yards west of mileboard; large oak tree, blazed and marked "490," in fork of road; nail in root	575.81
Center, 10 miles southwest of; oak tree on north side of road, blazed and marked "596;" nail in root	581.49
Ricks post-office, $3\frac{1}{4}$ miles west of; about 50 feet south of fork at blacksmith shop and dwelling; nail in root of oak on north edge of road	565.679
Ricks post-office, about $2\frac{1}{2}$ miles west of; nail in root of hickory in south edge of road; blazed and marked "607"	593.018
Ricks post-office, $1\frac{1}{2}$ miles west of; nail in root of large white oak on north edge of road in hollow; blazed and marked "584"	570.24
Ricks post-office, about $\frac{1}{4}$ mile west of; 250 yards west of first dwelling; nail in root of large oak on north edge of road; blazed and marked "602".	587.46

GLENCOE TO EAST GADSDEN.

Glencoe post-office, near; nail in root of oak tree on northeast side of Gadsden road, near west end of schoolhouse at Lonesome Bend crossroad	550.74
Gadsden, $4\frac{1}{4}$ miles south of; nail in root of red-oak tree on east side of Gadsden and Glencoe road	559.38
Gadsden, about 1 mile southeast of East Gadsden; nail in root of small oak tree 60 feet west of Louisville and Nashville Railroad and 50 feet south of road to Hokes Bluff road at crossing	587.16
East Gadsden, $\frac{1}{2}$ mile southeast of station; southeast corner of forks of Gadsden, Jacksonville, and Hokes Bluff roads; iron post, marked "566 R"	551.569

JACKSONVILLE TO DUKE, VIA ALEXANDRIA AND HEBRON.

Oxford, opposite 13-mile sign to; nail in root of oak tree on north side of road from Jacksonville to Alexandria and Anniston, opposite forks	713.40
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	Feet.
Little Tallasahatchee Creek, 100 feet east of crossing of; nail in root of large oak south side of Jacksonville and Alexandria road	604.66
Jacksonville, nearly 3 miles west of; nail in root of small double oak on north side of road to Alexandria at farm road at top of hill	738.23
Jacksonville, about 3 miles west of; nail in root of oak tree on southwest fork of Alexandria and Jacksonville road and Talladega road	709.52
Jacksonville, about 5½ miles west of; 300 feet west of road to Weavers station; nail in root of persimmon tree on north side of Jacksonville and Alexandria road	592.81
Jacksonville, about 6½ miles west of; nail in root of red-oak tree on north side of Jacksonville and Alexandria road, opposite fork of road	696.04
Jacksonville, about 6½ miles west of; nail in root of small hickory tree on south side of Jacksonville and Alexandria road	658.18
Jacksonville, about 7 miles west of; nail in root of cedar tree 30 feet west of Anniston crossroad, south side of Alexandria road	616.86
Alexandria; north side of road to Hebron, opposite fork of road to Morrisville; nail in root of oak tree at	568.44
Alexandria, top of west rail Louisville and Nashville Railroad at	564.67
Alexandria, about 1½ miles northwest of, and about 300 feet east of Wilkerson Branch; nail in root of small sugarberry tree on southeast corner of fork of Hebron and Middleton roads	531.22
Gadsden road, 1 mile northwest fork of; nail in root of large black oak on northeast side of road to Hebron	547.18
Hebron, about 1½ miles southeast of and about 0.6 mile northwest of Tallasahatchee bridge; iron post, southwest corner fork of Hebron and Graton roads, marked "R 582"	568.105
Hebron, about ½ mile north of; nail in root of large hickory or elm on west side of road to Hebron, about 200 feet south of top of mountain	693.22
Hebron station, about 600 feet south of; nail in root of walnut tree on east side of road from Alexandria to Hebron, 100 feet southeast of crossing of East and West Railroad	562.61
Duke, 2 miles south of, and 120 feet north of mile sign to; railroad spike in telegraph pole on west side of dirt road on east side of East and West Railroad	555.12
Duke, about 1 mile south of; 75 feet south of crossing East and West Railroad, nail in root of small black oak on west side of dirt road to Duke ..	555.20
Read, about 1 mile south of; railroad spike in telegraph pole on west side of Louisville and Nashville Railroad at road crossing	572.45

ALEXANDRIA, VIA MORRISVILLE AND MECHANICSVILLE, TO ANNISTON.

Alexandria, northwest corner of Hebron and Morrisville roads at; opposite blacksmith shop and 150 feet west of post-office; iron post, marked "R 577"	563.150
Alexandria, 1 mile west of; nail in root of cedar tree at southwest angle of fork at Morrisville and Anniston roads, and 1 mile opposite signs "To Jacksonville, 9 miles," "To Anniston, 9 miles"	560.67
Alexandria, 4 miles west of; nail in root of small oak tree on southeast side of road from Alexandria to Morrisville	604.78
Morrisville, ½ mile east of; nail in root of red oak on top of hill, bearing sign "To Anniston, 11 miles," at fork of road	685.20
Morrisville, east side of road, 100 feet southwest of bridge over Cane Creek; iron post, marked "R 570"	555.908
Morrisville, 1½ miles west of, at Anniston and Talladega crossroads; nail in root of oak on west side of road from Morrisville to Anniston, bearing sign "To Jacksonville, 14 miles"	623.51

	Feet.
Morrisville, about 2 miles south of; front of Settleff's house, 300 feet north of fork of road to Greensport; nail in root of cedar tree on west side of road to Anniston from Morrisville.....	560. 05
Morrisville and Talledaga roads, $\frac{1}{4}$ mile southeast of fork of; nail in root of small oak tree on north side of new road to Anniston	659. 00
Haney's house, about $\frac{1}{4}$ mile south of schoolhouse and church in front of; nail in root of small white oak on west side of road to Anniston from Morrisville	772. 50
Morrisville road to Anniston, at fork of; 300 feet east of fork of road to Bynum; nail in root of gum tree on west side of road.....	676. 94
Anniston, about $6\frac{1}{4}$ miles west of; nail in root of small black oak on west side of road at top of ridge	820. 40
Anniston, about $5\frac{1}{4}$ miles west of; nail in root of red oak at fork of Anniston and Eulaton roads	666. 37
Anniston, about $5\frac{1}{4}$ miles west of; nail in root of small gum tree on southwest side of forks of road.....	665. 71
Anniston, about $4\frac{1}{4}$ miles west of; nail in root of black-oak tree at northwest corner forks of Anniston and Eulaton roads	661. 60
Anniston, about $3\frac{1}{4}$ miles west of; nail in root of black oak on south side of road east of forks near Southern Railway crossing	704. 20
Mechanicsville, 100 feet east of top of ridge at; nail in root of black-oak tree on south side of road	801. 00
Anniston, 50 feet east of where trolley switches form loop; nail in root of hickory tree on north side of Twelfth street	709. 28
Anniston, Union station at; bronze tablet in stone base of south face of southeast column of porch east side of station, marked "A 710"	709. 902
ANNISTON TO CHOCCOLOCCO, VIA OXFORD AND DE ARMANVILLE.	
Anniston, northeast corner of Eighteenth and Noble streets; top of rock at iron drain cover, marked "749" on telegraph pole.....	748. 99
Anniston, between Twenty-fifth and Twenty-sixth streets; copper bolt in wall of J. L. Murphy's yard on east side of Noble street, marked "A 810".	809. 844
Anniston, northwest corner Eighteenth and Leyton streets; top of fire bolt	762. 24
Anniston, about 1 mile from northeast corner of Eighteenth street and Rocky Hollow road; top of city-limit post on north side of Rocky Hollow road.....	879. 68
Anniston, 3 miles northeast of station at; copper bolt in bowlder 25 feet south of Rocky Hollow road and 200 feet west of where road crosses ridge, marked "A 1135"	1, 134. 626
Anniston, about $\frac{1}{4}$ mile south of Tenth street at; bolthead, bottom of strut, at northwest end of bridge over Snows Creek on Noble street....	670. 20
Oxanna, crossing Fourteenth street at; top of rail of trolley line	655. 89
Oxford depot, about 650 feet north of; 50 feet north of crossing of Birmingham Division Southern Railway and 250 feet south crossing Snows Creek; railroad spike in telegraph pole on east side of dirt road.....	637. 62
Fair grounds, $\frac{1}{4}$ mile west of; 60 feet east of farm road; nail in root of red-oak tree 20 feet north of Oxford, Boiling and Choccolocco road.	618. 13
Oxford, about $\frac{1}{4}$ mile east of; opposite Settlement road near cabin; top of small oak post on south side of road	637. 56
Oxford, 3 miles east of; nail in root of large oak tree on northeast corner of Choccolocco and Chulafinnee roads.....	628. 95
De Armanville, $\frac{1}{4}$ mile west of; nail in root of red-oak tree on south side of Oxford and Choccolocco road, near gate and farm road.....	653. 34
De Armanville; nail in root of large white oak at intersection of Anniston and Oxford roads at.....	672. 54

	Feet.
De Armanville, 1 mile east of; about 400 feet west of railroad crossing; nail in root of large white-oak tree on south side of road to Choccolocco.	680.26
Choccolocco, about 1 mile from; front of Miss M. Border's house; nail in root of red-oak tree at south side of road and railroad at crossing.....	689.16
Choccolocco station, opposite east end of; iron post 20 feet north of Birmingham Division Southern Railway, marked "A 671".....	670.896
Choccolocco, $\frac{1}{4}$ mile east of; top of rail crossing at White Plains road	677.80
Oxford to Choccolocco, road from; 100 feet east of Boiling Spring road; iron post on south side of road, marked "633".....	632.715

CHOCOLOCCO TO JENKINS, VIA WHITE PLAINS.

Choccolocco, $1\frac{1}{4}$ miles north of; nail in root of persimmon tree on east side of road to White Plains.....	691.26
White Plains, about 4 miles south of, near well and group of cabins; nail in root of white-oak tree on west side of road to White Plains from Choccolocco	689.86
White Plains, 3 miles south of; 1,200 feet north of church; nail in root of white oak on east side of road from Choccolocco to White Plains	712.31
White Plains, road from Choccolocco to; nail in root of large red oak on east side of road opposite Dark Corner road.....	720.89
White Plains, about $1\frac{1}{4}$ miles southwest of; nail in root of large oak tree at corner of White Plains and Settlement roads, front of Prof. T. A. Anderson's house.....	702.97
White Plains and Hickory roads, nail in root of oak tree at southeast angle of	725.54
White Plains, $\frac{1}{4}$ mile south of; nail in root of sassafras tree at forks of road at foot of hill.....	717.29
White Plains; iron post west side of Main street opposite road to Jenkins, marked "A 722"	722.247

LITTLE TERRAPIN CREEK TO EDWARDSVILLE, VIA SAUNDERS.

Little Terrapin Creek, $\frac{1}{4}$ mile west of; nail in root of oak tree on south side of road to Grantley	931.67
Parkers Creek, 200 feet south of; copper bolt in small out-cropping rock on west side of road to Edwarsville.....	821.776
Parkers Creek, $\frac{1}{4}$ mile southwest of, at James J. Parker's house; nail in root of red oak at south side of road to Edwarsville.....	953.04
Parkers Creek, about 2 miles southwest of; chisel mark on ledge of rock on west side of road over Saunders Mountain at head of hollow.....	1,075.04
Saunders Mountain, top of; nail in root of oak tree on south side of road.	1,369.65
Edwardsville, about 11 miles north of; copper bolt in rock on west side of road to Edwarsville 300 feet south of Saunders Branch, marked "A 1266".....	1,265.851
Saunders Branch, 600 feet south of; nail in root of oak tree on west side of road	1,264.47
Edwardsville, $9\frac{1}{4}$ miles north of; nail in root of black-oak tree on east side of road.....	1,279.30
Edwardsville, $8\frac{1}{4}$ miles north of; $\frac{1}{4}$ mile south of Shoal Creek post-office, nail in root of red-oak tree on west side of road to Edwarsville.....	1,189.59
Edwardsville, $7\frac{1}{4}$ miles north of; nail in root of small white-oak tree at gate in front of log house near creek crossing	1,201.28
Edwardsville, 6 miles north of; nail in root of red-oak tree on east side of road near milepost tree	1,301.88
Edwardsville, about $5\frac{1}{4}$ miles north of; nail in root of hickory tree on west side of road at top of ridge at trail	1,452.36

	Feet.
Edwardsville, $4\frac{1}{2}$ miles north of; nail in root of oak tree on east side of road	1, 221. 22
Edwardsville, 3 miles north of; nail in root of red oak on east side of road at old road opposite W. M. Grow's house	1, 048. 47
Edwardsville, $2\frac{1}{2}$ miles north of; nail in root of small red-oak tree south-east corner of Shoal Creek, Oak Level and road to	976. 59
Edwardsville, $1\frac{1}{2}$ miles north of; top of Edwardsville city-limit post corner of Shoal Creek and Pounds Mill roads	992. 13
Edwardsville, near southeast corner Cleburne County court-house at; bronze tablet on east side, marked "A 987"	986. 332

EDWARDSVILLE TO CHOCOLOCCO, VIA HEFLIN AND OLD DAVISVILLE.

Edwardsville, about 3 miles west of; at railroad crossing; nail in root of oak tree on west side of Settlement road	1, 013. 03
Heflin, crossing sign $1\frac{1}{2}$ miles east of; third crossing east of Heflin; railroad spike in	1, 012. 29
Heflin, 100 feet west of depot on east side of street at; iron post 40 feet north of Birmingham Division, Southern Railway, marked "A 975"	975. 217
Old Davisville, about 1 mile east of; about 800 feet west of highway bridge over railroad; nail in root of red oak on north side of road to Heflin	899. 19
Old Davisville; southeast corner Chulafinnee, Iron City, and Anniston roads; iron post, marked "A 724"	724. 213
Railroad crossing, 100 feet northeast of, and White Plains road to Iron City; nail in root of large oak	758. 45

HEFLIN TO CHULAFINNEE, VIA ROSS MOUNTAIN, CEDAR CREEK, BEASONS MILL, AND DYING CREEK.

Heflin, 1 mile south of; nail in root of oak tree on west side of road from Heflin to Ross bridge at top of ridge	974. 62
Bad Branch, 0.3 mile north of; about 2 miles south of Heflin; nail in root of black oak tree on east side of road from Heflin to Ross bridge	893. 48
Bad Branch; forks of road	847. 32
Heflin, 3 miles from; nail in root of oak tree at angle of crossroads bearing sign "To Pinetucky Gold Mines 11 miles, to Chulafinnee 5 miles," etc. .	886. 08
Ross Mountain, foot of, on north side; nail in root of hickory tree on east side of road to Beasons Mill	884. 14
Ross Mountain, top of; nail in root of oak tree on east side of road to Beasons Mill	1, 070. 13
Cedar Creek, crossing of; nail in root of large gum tree on southeast side of crossing	826. 41
Arbacoochee, at fork of road opposite 3-mile sign to; nail in root of oak tree bearing sign "To Pinetucky Gold Mines 8 miles"	923. 14
Beasons Mill, iron post at fork of Chulafinnee and Pinetucky Gold Mine roads, marked "A 888"	887. 882
Dying Creek, west end of bridge over; about $5\frac{1}{2}$ miles southeast of Chulafinnee; nail in root of large white-oak tree	833. 09
Denman's Bridge, about 1 mile east of; opposite Morris's house; nail in root of oak tree on north side of road to Chulafinnee	848. 53
Tallapoosa, east side of Denman's Bridge over; nail in root of oak tree on south side of road to Chulafinnee	819. 31
Chulafinnee, $1\frac{1}{2}$ miles northeast of; nail in root of hickory tree on south side of Oxford road about 150 feet west of Chulafinnee crossroad	869. 86
Chulafinnee, $\frac{1}{2}$ mile east of; nail in root of beech tree on north side and 100 feet west of Chulafinnee Creek	833. 50

TRIANGULATION AND SPIRIT LEVELING.

405

CHULAFINNEE TO OXFORD, VIA ABLE AND HICKS.

	Feet.
Chulafinnee, 100 feet north crossroads at; iron post front of J. T. Rusk's store, marked "A 871"	871.483
Chulafinnee, about 1 mile west of, near two houses; nail in root of small oak tree on north side of road.....	885.76
Chulafinnee, 2½ miles west of; nail in root of oak tree at fork of road	957.15
Able, about 1 mile east of; nail in root of white-oak tree on south side of road to Able from Chulafinnee on east side of Chulafinnee Creek.....	867.96
Able post-office, opposite Nixon road at; nail in root of hickory tree on north side of road	975.80
Able and Hicks, between; nail in root of beech tree on south side of second mountain.....	687.78

HICKS TO EULATON, VIA JENIFER.

Hicks; opposite forks of road to Boiling Spring; iron post, marked "647 A"	646.871
Hicks, 1.32 miles west of; nail in root of red-oak tree on south side of road, 200 feet west of branch flowing north.....	683.46
Hicks, 1.87 miles west of; nail in root of sweet-gum tree on south side of road, 10 feet west of branch flowing northwest.....	670.93
Hicks, 3.08 miles west of; nail in root of persimmon tree on north side of road.....	706.25
Hicks, 4.52 miles west of; nail in root of wild cherry tree on north of road and west of road turning to north.....	631.51
Hicks, 4.69 miles west of; 0.17 mile north of Munford road; on road running north; 10 feet east of center of road; 100 feet south of branch flowing west; aluminum plate set in stone and marked "630 A".....	630.747
Hicks, 5.90 miles west of; nail in root of hickory tree on north of road...	684.32
Hicks, 7.89 miles west of; nail in root of post-oak tree on south of road...	625.86
Jenifer, about 1 mile east of; nail in root of persimmon tree on north of road.....	631.72
Jenifer, blast furnace at; on north point near northeast corner of engine house; aluminum plate set in wall; marked "577 A"	576.999
Jenifer, about 2 miles north of; base of rail at crossing of Louisville and Nashville Railroad.....	597.81
Jenifer, 3.50 miles north of; road to Eulaton; nail in root of pine tree on east side of road, 40 feet south of junction with road from southeast....	604.31
Coldwater, pumping station at; on west wall near northwest corner, 18 inches above surface of ground; aluminum plate set in wall, marked "597 A"	597.128
Eulaton, Southern Railway crossing at; top of rail.....	650.23
Anniston, 4½ miles west of; forks of Eulaton and Anniston roads; nail in root of black-oak stump in northwest corner	661.74

CENTRAL SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. John H. Renshawe, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in the various localities, as follows:

ARKANSAS.

WASHINGTON, CRAWFORD, AND FRANKLIN COUNTIES.

WINSLOW QUADRANGLE.

The elevations in the following list are based on the United States Coast and Geodetic Survey bench mark at Rudy, Crawford County.

The bench mark consists of a small square hole cut in the pier at the south end of the iron part of the railroad bridge over Clearwater Creek, about 2 miles north of Rudy. The bench mark is about the center of the second capstone from the west end of the pier. The bottom of the square hole is the bench mark, and the elevation is 535.08 feet above mean sea level.

The leveling was done by Mr. Robert Coe, levelman, under the direction of Mr. H. B. Blair, topographer.

WASHINGTON COUNTY.

	Feet.
T. 15 N., R. 33 W., S. 16, southeast corner of; $\frac{1}{4}$ mile southeast of Summers; iron post, marked "F. S. 1192"	1, 192. 398
T. 15 N., R. 32 W., S. 27, top of hill south side of wagon road between Prairie Grove and Boonsboro; iron post, marked "F. S. 1414"	1, 413. 942
T. 15 N., R. 31 W., S. 18, Prairie Grove; brick store southwest corner Mack and Buchanan streets; aluminum tablet, marked "F. S. 1168"	1, 167. 925
T. 15 N., R. 31 W., on line between sections 15 and 16, Illinois chapel; iron post, marked "F. S. 1146"	1, 146. 044
T. 15 N., R. 29 W., S. 22, Sulphur City; foundation southwest corner post-office; aluminum tablet, marked "F. S. 1364"	1, 364. 625
T. 14 N., R. 33 W., S. 21, Dutch Mills, on Main street, in front of White, Reed & Co.'s store; iron post, marked "F. S. 1027"	1, 027. 210
T. 14 N., R. 32 W., S. 17, Clyde, in front of schoolhouse; iron post, marked "F. S. 1325"	1, 324. 688
T. 14 N., R. 31 W., S. 23, near Longview schoolhouse; iron post, marked "F. S. 1900"	1, 900. 257
T. 14 N., R. 29 W., S. 10, $\frac{1}{4}$ mile northwest of Arnett post-office, near main gate of cemetery; iron post, marked "F. S. 1401"	1, 401. 399
T. 13 N., R. 32 W., S. 35, southeast corner of; iron post, marked "F. S. 1727"	1, 727. 127
T. 13 N., R. 31 W., S. 7, Strickler, northwest corner John Neal's fence; iron post, marked "F. S. 1568"	1, 568. 697
Winslow, on ledge of rock southeast corner Dunlap's drug store; aluminum tablet, marked "F. S. 1742"	1, 742. 022
T. 13 N., R. 29 W., S. 1, Low Gap, crossroads in gap of Boston Mountains; iron post, marked "F. S. 2042"	2, 042. 153

CRAWFORD COUNTY.

T. 12 N., R. 32 W., S. 25, $\frac{1}{4}$ corner south side of Lees Creek post-office; iron post, marked "F. S. 755"	755. 136
T. 12 N., R. 31 W., S. 23, $\frac{1}{4}$ corner east side of; iron post, marked "F. S. 1934"	1, 733. 970
T. 12 N., R. 29 W., S. 28, southeast corner of, near Sandpoint post-office; iron post, marked "F. S. 1606"	1, 606. 608
T. 11 N., R. 32 W., S. 15, Natural Dam post-office; iron post, marked "F. S. 672"	671. 786
T. 11 N., R. 31 W., S. 2, near southeast corner of; iron post, marked "F. S. 1565"	1, 565. 037
T. 11 N., R. 29 W., S. 34, Plymouth post-office; iron post, marked "F. S. 794"	793. 993
T. 10 N., R. 32 W., S. 22, Stattler post-office; iron post, marked "F. S. 903"	902. 903
T. 10 N., R. 30 W., S. 9, $\frac{1}{4}$ corner east side of Belmont post-office; iron post, marked "F. S. 873"	872. 961

IOWA-WISCONSIN.

CLAYTON, DELAWARE, AND DUBUQUE COUNTIES, IOWA; GRANT COUNTY, WISCONSIN.

ELKADER QUADRANGLE.

The elevations in the following list depend on the Mississippi River Commission bench mark at Dubuque, which is the same as was used in the seasons of 1896 and 1897. The bench mark is in the northeast corner of the custom-house and is a copper bolt marked "U.S.P.B.M.," the elevation of which is 434.81 feet above mean sea level (see Eighteenth Annual Report, part I, p. 326).

The leveling was done by Mr. G. W. Zorn, levelman, under the direction of Mr. R. C. McKinney, topographer.

IOWA.

	Feet.
T. 93 N., R. 2 W., Guttenberg, northeast corner Herder and First streets; aluminum tablet, marked "DBQ 630".....	630.366
T. 93 N., R. 2 W., S. 31, near north line of, in school grounds; iron post, marked "DBQ 681".....	680.773
T. 93 N., R. 3 W., S. 18, in southeast $\frac{1}{4}$ of; Garnaville, southeast corner of park; iron post, marked "DBQ 1065".....	1,065.497
T. 94 N., R. 3 W., S. 8, in southwest $\frac{1}{4}$ of, northwest corner of schoolhouse yard; iron post, marked "DBQ 699".....	698.965
T. 95 N., R. 3 W., S. 33, in southeast $\frac{1}{4}$ of, southwest corner schoolhouse yard; iron post, marked "DBQ 1103".....	1,103.406
T. 94 N., R. 4 W., S. 15, in southeast $\frac{1}{4}$ of; National, southwest corner of schoolhouse yard; iron post, marked "DBQ 1110".....	1,110.161
T. 94 N., R. 5 W., S. 15, southwest corner of, southwest corner schoolhouse yard; iron post, marked "DBQ 1177".....	1,177.245
T. 93 N., R. 5 W., S. 23; Elkader, northeast corner court-house yard; iron post, marked "DBQ 759".....	758.745
T. 92 N., R. 5 W., S. 22, in southwest $\frac{1}{4}$ of; Mederville, southwest corner schoolhouse yard; iron post, marked "DBQ 767".....	766.726
T. 92 N., R. 4 W., S. 16, in southwest $\frac{1}{4}$ of, southeast corner schoolhouse yard; iron post, marked "DBQ 929".....	929.367
T. 92 N., R. 3 W., S. 9, in southwest $\frac{1}{4}$ of, in schoolhouse grounds; iron post, marked "DBQ 959".....	958.947
T. 91 N., R. 5 W., S. 16, $\frac{1}{4}$ corner south side of; iron post, marked "DBQ 1240".....	1,240.461
T. 90 N., R. 5 W., S. 21, southwest corner of; iron post, marked "DBQ 1016".....	1,015.980
T. 90 N., R. 4 W., S. 20, Greeley; iron post, marked "DBQ 1142".....	1,142.547
T. 90 N., R. 3 W., S. 28, $\frac{1}{4}$ corner east side of, southeast corner schoolhouse yard; iron post, marked "DBQ 1090".....	1,090.041
T. 90 N., R. 2 W., S. 21; Luxemburg, in Catholic churchyard; iron post, marked "DBQ 1179".....	1,179.638
T. 93 N., R. 4 W., S. 9, center of; Clayton Center, southeast corner of school yard; iron post, marked "DBQ 1038".....	1,037.605

KANSAS.

WESTERN KANSAS, 1896.

(J. C. BARBER, LEVELMAN.)

	Feet.
Garden, Kansas; Atchison, Topeka and Santa Fe Railway, top of rail in front of telegraph office.....	2,829.000
Garden, Kansas; court-house, southwest corner of; copper plate, marked "G. C. 2832"	2,832.034
Garden, Kansas; First National Bank, southwest side main entrance; copper plate, marked "G. C. 2830"	2,830.185
T. 24 S., R. 33 W., S. 15; on north and south line through center of; 48 feet south of Atchison, Topeka and Santa Fe Railway, between Garden and Sherlock, Kansas; iron post, marked "G. C. 2853"	2,853.022
T. 24 S., R. 33 W., S. 7; 450 feet north and 70 feet west of east $\frac{1}{2}$ corner of; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 2870"	2,869.964
T. 24 S., R. 34 W., S. 3; 1,100 feet south and slightly west of east $\frac{1}{2}$ corner of; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 2892"	2,892.095
T. 24 S., R. 34 W., S. 6; 1,417 feet south of east $\frac{1}{2}$ corner of; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 2908"	2,908.059
T. 24 S., R. 35 W.; 6 feet west of line between sections 10 and 11; 2,200 feet west of Deerfield station; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 2940"	2,940.104
T. 24 S., R. 35 W.; 6 feet west of line between sections 17 and 18; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 2969"	2,968.966
T. 24 S., R. 36 W.; 60 feet east of line between sections 26 and 27; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 2991"	2,990.914
T. 25 S., R. 36 W., S. 5; 1,050 feet south of northwest corner; iron post, marked "G. C. 3013"	3,012.963
T. 25 S., R. 37 W., S. 10; 600 feet north of southeast corner of; north of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 3040"	3,039.891
T. 25 S., R. 37 W.; line between sections 7 and 8; north side Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 3063" ..	3,063.102
T. 25 S., R. 38 W., S. 3; 650 feet west of east side of; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 3112" ...	3,112.044
T. 24 S., R. 38 W., S. 30; 150 feet east of west side of; north side of Atchison, Topeka and Santa Fe Railway tracks; iron post, marked "G. C. 3123" ..	3,122.988
T. 24 S., R. 39 W.; 12 feet west of line between sections 22 and 21; south side of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 3152"	3,152.234

KEARNEY, HAMILTON, STANTON, AND GRANT COUNTIES.

HARTLAND AND SYRACUSE QUADRANGLES.

The elevations in the following list are based on the bronze tablet in the southwest corner of the court-house at Garden, marked "2832," the adjusted elevation of which is 2,832.034 feet above mean sea level. The initial height from which this bench mark is established is the top

of rail on main track Atchison, Topeka and Santa Fe Railway, in front of telegraph office at Garden, using the railroad company's elevation, 2,829.

The leveling in this district was done by Mr. M. C. McFarlane, levelman, under the direction of Mr. John H. Renshaw, geographer.

WESTERN KANSAS, 1897.

(M. C. M'FARLANE, LEVELMAN.)

	Feet.
T. 23 S., R. 42 W.; 12 feet east of fence between sections 31 and 36; 47 feet south of Atchison, Topeka and Santa Fe Railway tracks; iron post, marked "G. C. 3278".....	3, 277. 882
T. 23 S., R. 42 W., S. 27; 1,848 feet south from northwest corner of; 48 feet south of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 3303".....	3, 302. 939
T. 23 S., R. 42 W., S. 19; 12 feet east from west side of; 48 feet south of Atchison, Topeka and Santa Fe Railway tracks; 1½ miles east of Coolidge station; iron post, marked "G. C. 3337".....	3, 337. 015
T. 23 S., R. 43 W., S. 22; 423 feet south from northwest corner of; 48 feet south of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 3353".....	3, 362. 684
T. 24 S., R. 36 W., S. 3; southeast of; iron post, marked "G. C. 3125".....	3, 125. 493
T. 24 S., R. 37 W., S. 21; northeast corner of; iron post, marked "G. C. 3244".....	3, 243. 950
T. 24 S., R. 38 W., S. 13; southeast corner of; iron post, marked "G. C. 3267".....	3, 267. 141
T. 24 S., R. 39 W.; 12 feet west of line between sections 21 and 22; 49 feet south of Atchison, Topeka and Santa Fe Railway tracks; 3 miles west of Kendall, Kansas; 20 feet west of private road crossing; iron post, marked "G. C. 3152".....	3, 152. 234
T. 24 S., R. 39 W., S. 19; 15 feet east and 10 feet south of northwest corner of; 46 feet south of Atchison, Topeka and Santa Fe Railway tracks; iron post, marked "G. C. 3175".....	3, 175. 261
T. 24 S., R. 40 W.; 40 feet north and 15 feet south [?] of ¼ corner between sections 15 and 16; 46.5 feet south of Atchison, Topeka and Santa Fe Railway tracks; iron post, marked "G. C. 3198".....	3, 198. 401
T. 24 S., R. 40 W., S. 7; 1,765 feet south and 30 feet east from northwest corner of; 47.5 feet south of Atchison, Topeka and Santa Fe Railway tracks; iron post, marked "G. C. 3230".....	3, 230. 315
T. 24 S., R. 41 W.; 10 feet east of fence between sections 3 and 4; 47 feet south of Atchison, Topeka and Santa Fe Railway track; iron post, marked "G. C. 3254".....	3, 254. 315
Hartland, Kansas, half mile east of; iron post, marked "G. C. 3040".....	3, 039. 891
T. 24 S., R. 37 W., S. 34; near ¼ corner west side of; triangulation station; iron post, marked "G. C. 3249".....	3, 248. 939
T. 25 S., R. 36 W., S. 2; 40 feet southeast from northwest corner of; iron post, marked "G. C. 2990".....	2, 989. 798
T. 25 S., R. 37 W.; near south side of; west side of Hartland-Ulysses wagon road; iron post, marked "G. C. 3039".....	3, 038. 718
T. 25 S., R. 38 W., S. 6; 70 feet southeast from northwest corner of; iron post, marked "G. C. 3147".....	3, 146. 576
T. 25 S., R. 40 W.; southwest corner of; iron post, marked "G. C. 3489" ..	3, 488. 934
T. 25 S., R. 41 W.; 30 feet west of Johnson wagon road; iron post, marked "G. C. 3392".....	3, 392. 481

	Feet.
Triangulation station west side Johnson road, about 8 miles south of Syracuse; iron post, marked "G. C. 3508".....	3, 507. 505
T. 26 S., R. 34 W., S. 31; 620 feet east of southwest corner of; iron post, marked "G. C. 3010".....	3, 009. 938
T. 26 S., R. 34 W., S. 34; southwest corner of; iron post, marked "G. C. 2990".....	2, 990. 128
T. 26 S., R. 35 W., S. 31; southwest corner of; iron post, marked "G. C. 3038".....	3, 097. 876
T. 26 S., R. 35 W., S. 34; southwest corner of; iron post, marked "G. C. 3026".....	3, 026. 328
T. 26 S., R. 36 W., S. 31; southwest corner of; iron post, marked "G. C. 3080".....	3, 079. 725
T. 26 S., R. 36 W., S. 33; southwest corner of; iron post, marked "G. C. 3084".....	3, 083. 716
T. 26 S., R. 37 W., S. 33; southeast corner of; iron post, marked "G. C. 3069".....	3, 068. 838
T. 26 S., R. 37 W., S. 16; south side of; 120 feet west of Hartland-Ulysses wagon road, iron post, marked "G. C. 3048".....	3, 048. 417
T. 26 S., R. 38 W., S. 33; southeast corner of; iron post, marked "G. C. 3177".....	3, 177. 267
T. 26 S., R. 38 W., S. 36; southeast corner of; iron post, marked "G. C. 3089".....	3, 089. 083
T. 26 S., R. 41 W., S. 23; 30 feet west and 30 feet south of northeast corner of; on wagon road from Syracuse to Johnson; iron post, marked "G. C. 3362".....	3, 362. 130
T. 26 S., R. 41 W., S. 36; southwest corner of (ground); east side of Syracuse-Johnson wagon road; iron post, marked "G. C. 3265".....	3, 265. 164
T. 27 S., R. 34 W., S. 31; southwest corner of; iron post, marked "G. C. 3054".....	3, 054. 285
T. 27 S., R. 34 W., S. 34; southwest corner of; iron post, marked "G. C. 3074".....	3, 073. 887
T. 27 S., R. 35 W., S. 31; southwest corner of; iron post, marked "G. C. 3119".....	3, 118. 557
T. 27 S., R. 35 W., S. 34; southwest corner of; iron post, marked "G. C. 3076".....	3, 076. 041
T. 27 S., R. 36 W., S. 31; southwest corner of; iron post, marked "G. C. 3016".....	3, 016. 146
T. 27 S., R. 36 W., S. 34; southwest corner of; iron post, marked "G. C. 3094".....	3, 093. 825
T. 27 S., R. 37 W., S. 33; southeast corner of; iron post, marked "G. C. 3060".....	3, 060. 400
T. 27 S., R. 37 W., S. 16; southeast corner of; iron post, marked "G. C. 3055".....	3, 054. 867
T. 27 S., R. 38 W., S. 36; southeast corner of; iron post, marked "G. C. 3078".....	3, 078. 245
T. 27 S., R. 38 W., S. 33; southeast corner of; iron post, marked "G. C. 3092".....	3, 091. 805
T. 27 S., R. 41 W., S. 13; southwest corner of; east side Syracuse-Johnson wagon road; iron post, marked "G. C. 3284".....	3, 283. 775
T. 27 S., R. 41 W., S. 36; southwest corner of; east side Syracuse-Johnson wagon road; iron post, marked "G. C. 3304".....	3, 304. 343
T. 28 S., R. 34 W., S. 31; southwest corner of; iron post, marked "G. C. 3007".....	3, 006. 790
T. 28 S., R. 34 W., S. 34; southwest corner of; iron post, marked "G. C. 2999".....	2, 999. 367
T. 28 S., R. 35 W., S. 31; southwest corner of; iron post, marked "G. C. 3048".....	3, 047. 640
T. 28 S., R. 35 W., S. 34; southwest corner of; iron post, marked "G. C. 3020".....	3, 020. 412
T. 28 S., R. 36 W., S. 31; southwest corner of; iron post, marked "G. C. 3059".....	3, 059. 232
T. 28 S., R. 36 W., S. 34; southwest corner of; iron post, marked "G. C. 3048".....	3, 047. 667
T. 28 S., R. 37 W., S. 29; southeast corner of; iron post, marked "G. C. 3050".....	3, 049. 598
T. 28 S., R. 37 W., S. 9; southeast corner of; iron post, marked "G. C. 3053".....	3, 053. 185
T. 28 S., R. 38 W., S. 33; southeast corner of; iron post, marked "G. C. 3106".....	3, 106. 486
T. 28 S., R. 38 W., S. 36; southeast corner of; iron post, marked "G. C. 3049".....	3, 049. 049
T. 28 S., R. 39 W., S. 33; southeast corner of; iron post, marked "G. C. 3187".....	3, 186. 517
T. 28 S., R. 39 W., S. 36; southeast corner of; iron post, marked "G. C. 3117".....	3, 117. 370
T. 28 S., R. 40 W., S. 33; southeast corner of; iron post, marked "G. C. 3276".....	3, 275. 937
T. 28 S., R. 40 W., S. 36; southeast corner of; iron post, marked "G. C. 3222".....	3, 222. 096

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
T. 28 S., R. 41 W., S. 13; southwest corner of; east side Syracuse-Johnson wagon road; iron post, marked "G. C. 3341"	3, 341. 298
T. 28 S., R. 41 W., S. 36; southeast corner of; iron post, marked "G. C. 3329" ..	3, 328. 581

WESTERN KANSAS, 1898.

(F. C. FRENCH, LEVELMAN; UNDER DIRECTION OF NAT. TYLER, JR., TOPOGRAPHER.)

T. 24 S., R. 42 W., S. 1, east side of; at fence corner 50 feet south of Arkansas River; iron post, marked "G. S. 3267"	3, 266. 986
T. 24 S., R. 42 W., S. 36, southeast corner of; iron post, marked "G. C. 3433" ..	3, 435. 419
T. 25 S., R. 42 W., S. 16, southeast corner of; iron post, marked "G. C. 3522" ..	3, 522. 101
T. 25 S., R. 42 W., S. 4, northeast corner of; iron post, marked "G. C. 3489" ..	3, 489. 429
T. 25 S., R. 41 W., S. 33, southeast corner of; iron post, marked "G. C. 3430" ..	3, 430. 353
T. 25 S., R. 39 W., S. 3, southeast corner of; iron post, marked "G. C. 3381" ..	3, 381. 016
T. 25 S., R. 39 W., S. 4, northeast corner of; iron post, marked "G. C. 3176" ..	3, 175. 511
T. 25 S., R. 38 W., S. 31, southwest corner of; iron post, marked "G. C. 3254" ..	3, 254. 289
T. 25 S., R. 35 W., S. 6, northwest corner of; iron post, marked "G. C. 2975" ..	2, 975. 357
T. 25 S., R. 35 W., S. 3, northwest corner of; iron post, marked "G. C. 2984" ..	2, 984. 394
T. 25 S., R. 34 W., S. 6, northwest corner of; iron post, marked "G. C. 2967" ..	2, 966. 901
T. 26 S., R. 42 W., S. 2, northeast corner of; iron post, marked "G. C. 3430" ..	3, 430. 353
T. 26 S., R. 42 W., S. 5, northeast corner of; iron post, marked "G. C. 3434" ..	3, 433. 710
T. 26 S., R. 40 W., S. 3, northeast corner of; iron post, marked "G. C. 3437" ..	3, 436. 912
T. 26 S., R. 40 W., S. 6, northeast corner of; iron post, marked "G. C. 3470" ..	3, 470. 236
T. 26 S., R. 39 W., S. 14, $\frac{1}{2}$ corner east side of; iron post, marked "G. C. 3322"	3, 321. 580
T. 26 S., R. 39 W., S. 6, northwest corner of; iron post, marked "G. C. 3409" ..	3, 408. 531
T. 27 S., R. 39 W., S. 36, southeast corner of; iron post, marked "G. C. 3126" ..	3, 126. 269
T. 27 S., R. 39 W., S. 33, southeast corner of; iron post, marked "G. C. 3164" ..	3, 164. 082
T. 27 S., R. 40 W., S. 36, southeast corner of; iron post, marked "G. C. 3193" ..	3, 192. 658
T. 27 S., R. 40 W., S. 33, southeast corner of; iron post, marked "G. C. 3264" ..	3, 264. 377
T. 27 S., R. 41 W., S. 33, southeast corner of; iron post, marked "G. C. 3351" ..	3, 351. 435
T. 27 S., R. 42 W., S. 36, southeast corner of; iron post, marked "G. C. 3396" ..	3, 396. 443
T. 27 S., R. 42 W., S. 33, southeast corner of; iron post, marked "G. C. 3477" ..	3, 476. 965
T. 28 S., R. 42 W., S. 33, southeast corner of; iron post, marked "G. C. 3446" ..	3, 446. 344
T. 28 S., R. 42 W., S. 36, southeast corner of; iron post, marked "G. C. 3408" ..	3, 407. 600
T. 28 S., R. 41 W., S. 33, $\frac{1}{2}$ corner east side of; iron post, marked "G. C. 3375"	3, 375. 345
T. 29 S., R. 35 W., S. 13, southeast corner of; iron post, marked "G. C. 3020" ..	3, 020. 262
T. 29 S., R. 35 W., S. 16, southeast corner of; iron post, marked "G. C. 3010" ..	3, 010. 008
T. 29 S., R. 36 W., S. 13, southeast corner of; iron post, marked "G. C. 3023" ..	3, 022. 951
T. 29 S., R. 36 W., S. 16, southeast corner of; iron post, marked "G. C. 3016" ..	3, 015. 693
T. 29 S., R. 37 W., S. 13, southeast corner of; iron post, marked "G. C. 2978" ..	2, 977. 752
T. 29 S., R. 37 W., S. 18, southwest corner of; iron post, marked "G. C. 3098" ..	3, 098. 008
T. 29 S., R. 38 W., S. 18, southwest corner of; iron post, marked "G. C. 3139" ..	3, 138. 822
T. 24 S., R. 41 W., S. 2, near center of; iron post, marked "G. C. 3247"	3, 246. 611

MICHIGAN.

DICKINSON COUNTY.

IRON MOUNTAIN DISTRICT (SPECIAL).

The elevations in the following list are based on the top of rail Chicago, Milwaukee and St. Paul Railway, in front of station at Iron Mountain. The elevation as accepted is 1,135 feet above mean sea level.

The leveling was done by Mr. Jesse L. Holman, under the direction of Mr. E. C. Bebb, assistant topographer.

	Feet.
T. 40 N., R. 30 W., S. 31, in northwest $\frac{1}{4}$ of; in northwest corner of courthouse, 10 feet north of west entrance; aluminum bolt, marked "IM 1155".....	1, 153.33
T. 40 N., R. 31 W., S. 1, in southwest $\frac{1}{4}$ of; in large trap rock 300 feet north of east end of bridge over Menominee River; aluminum tablet, marked "IM 1108".....	1, 108.07
T. 39 N., R. 30 W., S. 3, in northeast $\frac{1}{4}$ of; Quinnesec, in southwest corner of large brick building owned by Capt. John Buell; aluminum tablet, marked "IM 1040".....	1, 039.77
T. 39 N., R. 29 W., S. 8, in northeast $\frac{1}{4}$ of; Norway, northeast corner of foundation of schoolhouse; aluminum tablet, marked "IM 946".....	945.61
T. 39 N., R. 28 W., S. 22, in northeast $\frac{1}{4}$ of; Waucesdah, northwest corner of foundation of schoolhouse; aluminum tablet, marked "IM 904".....	904.44

MISSOURI-ILLINOIS.

LINCOLN, ST. CHARLES, FRANKLIN, AND ST. LOUIS COUNTIES, MISSOURI;
CALHOUN COUNTY, ILLINOIS.

O'FALLON QUADRANGLE.

The elevations in the following list are based on the Missouri River Commission bench mark at St. Charles, Missouri. The bench mark is on the north side of Lawrence street, 25 feet west of the center of Missouri, Kansas and Texas Railway track, in the southeast corner of David Lane's lot, 1 foot west from fence, being the top of copper bolt in bench-mark stone. The elevation is 448.263 feet above mean sea level.

The leveling in the part of the quadrangle south of the Missouri River was done in the season of 1897 by Mr. Jesse L. Holman, and that in the part north of the river in the season of 1898 by Mr. Charles La Rue, the work of both seasons being under the direction of Mr. Paul Holman, topographer.

MISSOURI, 1897.	Feet.
T. 45 N., R. 4 E., S. 36, in southeast $\frac{1}{4}$ of; Manchester, near Henry avenue and Rock road; iron post, marked "St. L. 512".....	512.292
T. 44 N., R. 4 E., S. 5, in southwest $\frac{1}{4}$ of; north of State road, 500 feet northeast of Mr. Shotwell's log house; iron post, marked "St. L. 739".....	739.238
T. 44 N., R. 3 E., S. 17, in southeast $\frac{1}{4}$ of; Hollow post-office, on south side State road; iron post, marked "St. L. 670".....	670.098
T. 44 N., R. 2 E., S. 25, in northwest $\frac{1}{4}$ of; near junction Manchester Rock road and road to Pacific; iron post, marked "St. L. 799".....	799.528
T. 45 N., R. 3 E., $\frac{1}{4}$ mile south of Bonhomme Station, on the Kansas City, St. Louis and Colorado Railroad, near southwest corner H. Hilkenkamp's store; iron post, marked "St. L. 670".....	670.866
Grover post-office, + mark cut on southwest corner of stone step.....	781.47
Bellefontaine post-office, + mark cut on stone step at southeast corner of.	633.79
Lake post-office, + mark cut on southwest corner of wall.....	629.60

MISSOURI, 1898.

T. 49 N., R. 1 E., S. 24, in northeast $\frac{1}{4}$ of; Chantilly, northwest corner schoolhouse grounds; iron post, marked "St. L. 634".....	633.782
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TRIANGULATION AND SPIRIT LEVELING.

413

	Feet.
Troy; aluminum tablet in foundation of county court-house, marked "572"	571.973
Moscow Mills, wagon road bridge over Cuyvre River, north end of abutment; aluminum tablet, marked "St. L. 461"	461.200
Flint Hill, stone doorsill of stone building owned by Bernard Beller; aluminum bolt, marked "St. L. 551"	550.984
T. 49 N., R. 3 E., S. 29, in northeast $\frac{1}{4}$ of, in yard of Smedley district school-house; iron post, marked "St. L. 574"	574.346
T. 44 N., R. 2 E.; Vals, foundation of Catholic school building; aluminum tablet, marked "St. L. 518"	517.716
T. 44 N., R. 2 E.; Gilmore, opposite east end of Wabash Railroad station; iron post, marked "St. L. 562"	561.683
T. 47 N., R. 3 E.; St. Peters, parapet wall of west abutment of Wabash Railroad bridge; aluminum tablet, marked "St. L. 445"	445.342
T. 46 N., R. 3 E.; Cottleville, foundation of public school building; aluminum tablet, marked "St. L. 516"	516.549
T. 46 N., R. 2 E.; Mechanicsville, in yard of Howell Institute building; iron post, marked "St. L. 719"	719.680
T. 45 N., R. 2 E., Missouri, Kansas and Texas Railway bridge over Little Femme Osage Creek, north end of east abutment; aluminum bolt, marked "St. L. 462"	462.060
T. 44 N., R. 1 E., S. 11, in southeast $\frac{1}{4}$ of; Augusta, ledge of white limestone rock 350 feet northwest of German Evangelical church; aluminum bolt, marked "St. L. 613"	613.171
T. 44 N., R. 1 E., Dutzow, south wall of Wengleford's hardware store; aluminum tablet, marked "St. L. 497"	497.023
T. 45 N., R. 1 E., S. 20, in southwest $\frac{1}{4}$ of; German Evangelical church at Femme Osage, in foundation of; aluminum tablet, marked "St. L. 659"	659.223
T. 44 N., R. 1 W., S. 24, in northeast $\frac{1}{4}$ of; on land of Charles Birbonne, north side of road from Femme Osage to Mechanicsville; iron post, marked "St. L. 778"	778.304
T. 45 N., R. 1 E., S. 5, in southwest $\frac{1}{4}$ of; Coppel, stone doorsill of brick store building; aluminum bolt, marked "St. L. 829"	828.697
T. 48 N., R. 1 W., S. 25, in northeast $\frac{1}{4}$ of; on land of Elizabeth Condor, west side of north and south wagon road; iron post, marked "St. L. 532"	532.281
T. 46 N., R. 1 W., S. 1, in southeast $\frac{1}{4}$ of; 3 miles south of Foristell, on north side of Boonalick road; iron post, marked "St. L. 745"	744.706
T. 47 N., R. 1 W., S. 24, in southeast $\frac{1}{4}$ of; north wall of stone box-culvert under Wabash Railroad $\frac{1}{4}$ mile west of Foristell; aluminum bolt, marked "St. L. 695"	695.186
T. 46 N., R. 2 E., S. 2, Catholic church at Dardenne, + mark cut on west end of upper stone step	617.94

NEBRASKA.

ARTHUR, M'PHERSON, KEITH, AND LINCOLN COUNTIES.

PAXTON QUADRANGLE.

The elevations in the following list depend on the bench mark established in the season of 1896 at Sidney, consisting of a copper bolt set in the astronomic monument in the parade grounds of old Fort Sidney, marked "U.S.G.S. 4086 ft. B.M." (See Eighteenth Annual Report, p. 338.)

The leveling was done by Mr. C. E. Hewitt, levelman, under the direction of Mr. M. Hackett, topographer.

	Feet.
T. 12 N., R. 26 W., S. 5, southeast corner of; iron post, marked "SIDNEY 3297".....	3, 296. 980
T. 12 N., R. 26 W., S. 12, southeast corner of; iron post, marked "SIDNEY 3244".....	3, 244. 348
T. 12 N., R. 35 W., S. 12, southeast corner of; iron post, marked "SIDNEY 3203".....	3, 202. 947
T. 12 N., R. 34 W., S. 12, southeast corner of; iron post, marked "SIDNEY 3183".....	3, 183. 178
T. 12 N., R. 33 W., S. 11, southeast corner of; iron post, marked "SIDNEY 3158".....	3, 158. 217
T. 13 N., R. 35 W., S. 30, southeast corner of; iron post, marked "SIDNEY 3020".....	3, 020. 358
T. 13 N., R. 34 W., S. 30, southeast corner of; iron post, marked "SIDNEY 3166".....	3, 166. 122
T. 13 N., R. 33 W., S. 30, southeast corner of; iron post, marked "SIDNEY 3138".....	3, 138. 387
T. 13 N., R. 32 W., S. 18, southeast corner of; iron post, marked "SIDNEY 3116".....	3, 116. 445
T. 13 N., R. 34 W., S. 7, southeast corner of; iron post, marked "SIDNEY 3114".....	3, 113. 978
T. 13 N., R. 33 W., S. 6, southeast corner of; iron post, marked "SIDNEY 3016".....	3, 015. 914
T. 14 N., R. 36 W., S. 6, near $\frac{1}{2}$ corner south side of; iron post, marked "SIDNEY 3090".....	3, 089. 620
T. 14 N., R. 35 W., S. 5, near center of; iron post, marked "SIDNEY 3322".....	3, 322. 228
T. 14 N., R. 36 W., S. 24, near center of, south side North Platte River; iron post, marked "SIDNEY 3082".....	3, 081. 521
T. 14 N., R. 35 W., S. 30, $\frac{1}{2}$ corner east side of; iron post, marked "SIDNEY 3067".....	3, 067. 224
T. 14 N., R. 34 W., S. 6, northeast corner of; iron post, marked "SIDNEY 3138".....	3, 138. 266
T. 14 N., R. 34 W., S. 30, northwest corner of; iron post, marked "SIDNEY 3021".....	3, 020. 537
T. 14 N., R. 33 W., S. 17, southeast corner of; iron post, marked "SIDNEY 2989".....	2, 989. 402
T. 14 N., R. 33 W., S. 18, southeast corner of; iron post, marked "SIDNEY 2913".....	2, 912. 698
T. 15 N., R. 36 W., S. 6, near $\frac{1}{2}$ corner east side of; iron post, marked "SIDNEY 3421".....	3, 420. 600
T. 15 N., R. 36 W., S. 30, in northeast $\frac{1}{2}$ of; iron post, marked "SIDNEY 3284".....	3, 283. 600
T. 15 N., R. 35 W., S. 6, near center of; iron post, marked "SIDNEY 3332".....	3, 331. 566
T. 15 N., R. 35 W., S. 30, southeast corner of; iron post, marked "SIDNEY 3248".....	3, 247. 703
T. 15 N., R. 34 W., S. 6, in southeast $\frac{1}{2}$ of; iron post, marked "SIDNEY 3320".....	3, 320. 304
T. 15 N., R. 34 W., S. 19, in northeast $\frac{1}{2}$ of; iron post, marked "SIDNEY 3291".....	3, 291. 146
T. 15 N., R. 33 W., S. 6, in northeast $\frac{1}{2}$ of; iron post, marked "SIDNEY 3130".....	3, 129. 963
T. 15 N., R. 33 W., S. 17, in southwest $\frac{1}{2}$ of; iron post, marked "SIDNEY 3129".....	3, 128. 815
T. 15 N., R. 33 W., S. 32, near $\frac{1}{2}$ corner south side of; iron post, marked "SIDNEY 2992".....	2, 991. 929

	Feet.
T. 15 N., R. 32 W., S. 6, near southeast corner of; iron post, marked "SIDNEY 3162".....	3, 161.565
T. 15 N., R. 32 W., S. 31, near $\frac{1}{2}$ corner south side of; iron post, marked "SIDNEY 2915".....	2, 915.289
T. 16 N., R. 36 W., S. 21, near $\frac{1}{2}$ corner west side of; iron post, marked "SIDNEY 3464".....	3, 464.186
T. 16 N., R. 36 W., S. 2, near southwest corner of; iron post, marked "SIDNEY 3454".....	3, 453.716
T. 16 N., R. 35 W., S. 18, near $\frac{1}{2}$ corner west side of; iron post, marked "SIDNEY 3381".....	3, 380.548
T. 16 N., R. 34 W., S. 7, near southeast corner of; iron post, marked "SIDNEY 3314".....	3, 313.719
T. 16 N., R. 33 W., S. 18, in northwest $\frac{1}{2}$ of; iron post, marked "SIDNEY 3148".....	3, 148.062
T. 16 N., R. 32 W., S. 7, near $\frac{1}{2}$ corner east side of; iron post, marked "SIDNEY 3182".....	3, 182.342
T. 17 N., R. 36 W., S. 3, in northwest $\frac{1}{2}$ of; iron post, marked "SIDNEY 3474".....	3, 474.042
T. 17 N., R. 36 W., S. 23, near southwest corner of; iron post, marked "SIDNEY 3450".....	3, 449.628
T. 17 N., R. 35 W., S. 4, in southwest $\frac{1}{2}$ of; iron post, marked "SIDNEY 3411".....	3, 410.538
T. 17 N., R. 35 W., S. 32, near center of; iron post, marked "SIDNEY 3450".....	3, 449.760
T. 17 N., R. 34 W., S. 20, in northeast $\frac{1}{2}$ of; iron post, marked "SIDNEY 3319".....	3, 318.592
T. 17 N., R. 34 W., S. 33, in southwest $\frac{1}{2}$ of; iron post, marked "SIDNEY 3371".....	3, 371.066
T. 17 N., R. 34 W., S. 12, in northeast $\frac{1}{2}$ of; iron post, marked "SIDNEY 3285".....	3, 285.013
T. 17 N., R. 33 W., S. 4, near $\frac{1}{2}$ corner north side of; iron post, marked "SIDNEY 3262".....	3, 262.336
T. 17 N., R. 33 W., S. 1, near center of; iron post, marked "SIDNEY 3236".....	3, 236.430
T. 17 N., R. 33 W., S. 45, near northeast corner of; iron post, marked "SIDNEY 3118".....	3, 117.967
T. 17 N., R. 32 W., S. 17, near northeast corner of; iron post, marked "SIDNEY 3264".....	3, 263.853
T. 18 N., R. 35 W., S. 33, near center of; iron post, marked "SIDNEY 3421".....	3, 421.241
T. 18 N., R. 34 W., S. 30, in southwest $\frac{1}{2}$ of; iron post, marked "SIDNEY 3353".....	3, 352.535

OHIO-KENTUCKY.

CINCINNATI AND VICINITY.

The elevations in the following list are based on the permanent bench mark established by the United States Coast and Geodetic Survey, consisting of a copper projection fixed in the west side of the court-house building, on the north side of the south door, about 2 feet above pavement, the elevation of which was accepted as 546.973 feet.

All bench marks set in this district were marked "CLN," in addition to figures of elevation.

The leveling was done by Mr. Ralph W. Stewart, levelman, under the general direction of Mr. Charles E. Cooke, topographer.

OHIO.

	Feet.
Cincinnati; Heinz's flats, in front of; chisel mark on curbstone.....	754. 3、
Madisonville; Baltimore and Ohio Southwestern Railroad crossing Central avenue, east end of south abutment of plate girder bridge, first step from bottom; aluminum tablet, marked "CIN 588"	587. 845
Norwood; John Niehaus's grocery store, in front of; chisel mark on curbstone	635
Winton Place, railroad bridge, about 400 feet southeast of station, west end of north abutment; aluminum tablet, marked "CIN 498"	498. 472
Cheviot; intersection Walnut street and Harrison pike; aluminum tablet, marked "CIN 915"	914. 600
Cleves; Township Hall, foundation of northwest corner of; bronze tablet, marked "CIN 499"	498. 700
Miamitown; large steel bridge across Miami River, top of south end of east abutment; bronze tablet, marked "CIN 522"	521. 875
Barnesburg; on Blue Rock pike, 1½ miles north of; south corner foundation of German Evangelical church; aluminum tablet, marked "CIN 863"	863. 109
Mount Airy; Andy Schindler's saloon; chisel mark on large stone in front of	929
Miamiville; G. H. Eveland's store; chisel mark on west end of lower stone step	589
Miamiville; Pennsylvania Railroad bridge across Little Miami River; east end of north abutment; aluminum tablet, marked "CIN 570"	569. 622
Mount Carmel; schoolhouse, coping southeast corner foundation; aluminum tablet, marked "CIN 882"	881. 811
Ninemile Creek, steel bridge ¼ mile south of junction of three forks, west end of northwest abutment; aluminum tablet, marked "CIN 589"	588. 627
California; city waterworks pumping station, east end of culvert nearest river running under driveway; aluminum tablet, marked "CIN 487" ..	487. 129
Little Miami River, 1½ miles northwest of California; chisel mark on north corner of east abutment steel bridge	491
California; Spencer Township Hall; chisel mark on northeast corner of lower step	492

KENTUCKY.

Fort Thomas; east side foundation of tower; aluminum tablet, marked "CIN 852"	852. 013
Florence, southwest corner intersection Burlington and Lexington pikes, southeast corner coping of foundation red brick building; aluminum tablet, marked "CIN 936"	935. 627
Burlington; foundation of court-house near northwest corner; aluminum tablet, marked "CIN 848"	847. 822
Hebron; A. Clove's store; chisel mark on stone at southeast corner of....	877
Constance; post-office building; chisel mark on highest point of stone in front of	497
Bromley; northeast corner Pleasant Run and Pike streets; chisel mark on low stone	489

OKLAHOMA.

The elevations in the following list are based on a permanent bench mark of the United States Geological Survey at Oklahoma City, Oklahoma. The bench mark is located at the intersection of the Atchison, Topeka and Santa Fe Railway with the Choctaw, Oklahoma and Gulf

Railroad, 60 feet east of the Atchison, Topeka and Santa Fe Railway tracks and 35 feet north of the Choctaw, Oklahoma and Gulf Railroad tracks. Iron post, marked "OKLA 1197," the elevation of which is 1,196.867. Permanent bench mark of the United States Geological Survey established in the season of 1897.

The leveling was done by Mr. Robert Coe, under the direction of Mr. J. H. Renshaw, geographer in charge.

	Feet.
Lexington; schoolhouse inclosure, southwest corner of; iron post, marked "OKLA 1083"	1, 083. 024
T. 6 N., R. 1 W., S. 3, southeast corner of; iron post, marked "OKLA 1111" ..	1, 110. 920
T. 6 N., R. 1 W., S. 1, southeast corner of, Indian meridian; stone at section corner	1, 050
T. 6 N., R. 1 E., S. 5, southeast corner of; iron post, marked "OKLA 1126" ..	1, 126. 239
T. 6 N., R. 1 E., S. 2, southeast corner of; iron post, marked "OKLA 1034" ..	1, 034. 488
T. 7 N., R. 2 E., S. 30, southeast corner of; iron post, marked "OKLA 1099" ..	1, 098. 692
T. 7 N., R. 1 E., S. 26, near southeast corner of; iron post, marked "OKLA 1035"	1, 035. 265
T. 7 N., R. 2 E., S. 7, near southeast corner of; iron post, marked "OKLA 1097"	1, 096. 669
T. 7 N., R. 1 E., S. 11, near southeast corner of; iron post, marked "OKLA 1126"	1, 125. 622
T. 8 N., R. 2 E., S. 30, southeast corner of; iron post, marked "OKLA 1093" ..	1, 093. 500
T. 8 N., R. 1 E., S. 26, southeast corner of; iron post, marked "OKLA 1050" ..	1, 050. 388
T. 8 N., R. 2 E., S. 7, southeast corner of, near Pleasant Valley schoolhouse; iron post, marked "OKLA 992"	991. 630
T. 8 N., R. 1 E., S. 11, near southeast corner of; iron post, marked "OKLA 1022"	1, 022. 481
T. 9 N., R. 2 E., S. 19, southeast corner of; iron post, marked "OKLA 1090"	1, 089. 687
T. 9 N., R. 1 E., S. 23, southeast corner of; iron post, marked "OKLA 1123"	1, 123. 155
T. 9 N., R. 1 E., S. 11, southeast corner of; iron post, marked "OKLA 1113"	1, 113. 241
T. 9 N., R. 2 E., S. 7, southeast corner of; iron post, marked "OKLA 1076"	1, 076. 058
T. 10 N., R. 2 E., S. 30, southeast corner of; iron post, marked "OKLA 1190"	1, 189. 502
T. 10 N., R. 1 E., S. 26, southeast corner of; iron post, marked "OKLA 1096"	1, 096. 099
T. 10 N., R. 2 E., S. 7, southeast corner of; iron post, marked "OKLA 1132"	1, 131. 798
T. 10 N., R. 1 E., S. 11, southeast corner of; sandstone ledge in old road; aluminum tablet, marked "OKLA 1168"	1, 167. 893
T. 11 N., R. 1 E., S. 26, southeast corner of; iron post, marked "OKLA 1116"	1, 115. 793
T. 11 N., R. 2 E., S. 30, southeast corner of; iron post, marked "OKLA 1132"	1, 131. 843
T. 11 N., R. 1 E., S. 11, southeast corner of; iron post, marked "OKLA 1173"	1, 172. 928
T. 11 N., R. 2 E., S. 7, southeast corner of; iron post, marked "OKLA 1147"	1, 146. 636
T. 12 N., R. 1 E., S. 26, southeast corner of; iron post, marked "OKLA 1085"	1, 085. 016

	Feet.
T. 12 N., R. 1 E., S. 11, southeast corner of; iron post, marked "OKLA 1094".....	1,094.493
T. 13 N., R. 1 E., S. 26, near southeast corner of; iron post, marked "OKLA 1030".....	1,029.522
T. 13 N., R. 1 E., S. 10, rock near southeast corner of; aluminum tablet, marked "OKLA 1024".....	1,023.808
T. 14 N., R. 1 E., S. 27, southeast corner of; iron post, marked "OKLA 900".....	899.588
T. 14 N., R. 1 E., S. 9, southeast corner of; iron post, marked "OKLA 956".....	956.003
T. 15 N., R. 1 E., S. 28, southeast corner of; iron post, marked "OKLA 914".....	914.340
T. 15 N., R. 1 E., S. 3, near southeast corner of; iron post, marked "OKLA 1011".....	1,010.775
T. 16 N., R. 1 E., S. 27, bowlder near southeast corner of; aluminum tablet, marked "OKLA 945".....	944.516
T. 16 N., R. 1 E., S. 3, southeast corner of; iron post, marked "OKLA 1074".....	1,074.363
T. 17 N., R. 1 E., S. 22, near southeast corner of; iron post, marked "OKLA 937".....	936.858
T. 16 N., R. 1 W., S. 1, rock about 500 feet west of southeast corner of; aluminum tablet, marked "OKLA 1093".....	1,093.434
T. 16 N., R. 1 W., S. 5, rock near $\frac{1}{2}$ corner, south side of; aluminum tablet, marked "OKLA 1198".....	1,198.039
Guthrie, Oklahoma; Guthrie National Bank, rock at foot of iron column in front of; aluminum tablet, marked "OKLA 982".....	982.243
Guthrie, Oklahoma; "Star Bazaar," rock at side of west entrance; aluminum tablet, marked "OKLA 984".....	983.601

SOUTH DAKOTA-NEBRASKA-IOWA.

CLAY AND UNION COUNTIES, SOUTH DAKOTA; DIXON COUNTY,
NEBRASKA; PLYMOUTH COUNTY, IOWA.

ELK POINT QUADRANGLE.

The elevations in the following list are based on the Mississippi River Commission bench mark at Yankton, South Dakota, the same datum having been used in the seasons of 1896-97. The bench mark consists of a stone in the bottom of a hollow post in the court-house yard, the elevation of which is 1,197.291 feet above mean sea level.

The leveling was done by Mr. D. C. Wray, levelman, under the direction of Mr. W. H. Griffin, topographer.

SOUTH DAKOTA.

	Feet.
T. 94 N., R. 48 W., S. 6, near northwest corner of; iron post, marked "YNKTN 1358".....	1,357.670
T. 93 N., R. 48 W., S. 6, near northwest corner of; iron post, marked "YNKTN 1314".....	1,314.090
T. 90 N., R. 48 W., S. 6, northwest corner of; iron post, marked "YNKTN 1111".....	1,111.023
T. 94 N., R. 49 W., S. 6, northwest corner of; iron post, marked "YNKTN 1383".....	1,382.506

TRIANGULATION AND SPIRIT LEVELING.

419

	Feet.
T. 93 N., R. 49 W., S. 6, northwest corner of; iron post, marked "YNKTN 1347".....	1, 347. 223
T. 92 N., R. 49 W., S. 6, northwest corner of; iron post, marked "YNKTN 1293".....	1, 293. 188
T. 91 N., R. 49 W., S. 6, northwest corner of; iron post, marked "YNKTN 1121".....	1, 121. 421
T. 90 N., R. 49 W., S. 6, northwest corner of; iron post, marked "YNKTN 1128".....	1, 128. 201
T. 94 N., R. 50 W., S. 6, northwest corner of; iron post, marked "YNKTN 1394".....	1, 393. 585
T. 93 N., R. 50 W., S. 6, northwest corner of; iron post, marked "YNKTN 1274".....	1, 274. 346
T. 92 N., R. 50 W., S. 6, northwest corner of; iron post, marked "YNKTN 1235".....	1, 235. 263
T. 91 N., R. 50 W., S. 6, northwest corner of; iron post, marked "YNKTN 1137".....	1, 136. 717
T. 94 N., R. 51 W., S. 6, northwest corner of; iron post, marked "YNKTN 1228".....	1, 227. 939
T. 93 N., R. 50 W., S. 6, northwest corner of; iron post, marked "YNKTN 1147".....	1, 147. 301
T. 92 N., R. 51 W., S. 6, northwest corner of; iron post, marked "YNKTN 1183".....	1, 182. 880

NEBRASKA.

T. 30 N., R. 6 E., S. 36, $\frac{1}{2}$ mile west from southeast corner of; iron post, marked "YNKTN 1348".....	1, 347. 930
T. 29 N., R. 6 E., S. 6, northwest corner of; iron post in schoolhouse yard, marked "YNKTN 1211".....	1, 211. 489
T. 31 N., R. 5 E., S. 6, northwest corner of; iron post, marked "YNKTN 1166".....	1, 166. 350
T. 31 N., R. 5 E., S. 36, southeast corner of; iron post, marked "YNKTN 1296".....	1, 296. 456
T. 30 N., R. 5 E., S. 6, northwest corner of; iron post, marked "YNKTN 1466".....	1, 466. 426
T. 29 N., R. 5 E., S. 6, northwest corner of; iron post, marked "YNKTN 1465".....	1, 465. 232

IOWA.

T. 92 N., R. 48 W., S. 6, northwest corner of; iron post, marked "YNKTN 1140".....	1, 140. 069
T. 91 N., R. 48 W., S. 6, northwest corner of; iron post, marked "YNKTN 1314".....	1, 314. 345

WISCONSIN.

SAUK COUNTY.

DENZER QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the northeast corner of the court-house at Baraboo, marked "B 890," the elevation of which is 889.681 feet. The elevation of this bench mark was determined from the top of rail in front of the passenger station of the Chicago and Northwestern Railway in Baraboo, which was given as 860.5 feet above mean sea level.

The leveling was done by Mr. D. C. Wray, levelman, under the direction of Mr. W. H. Griffin, topographer.

	Feet.
T. 11 N., R. 6 E., S. 27, northwest corner of; iron post, marked "B 1200"...	1, 199.673
T. 10 N., R. 6 E., S. 9, $\frac{1}{2}$ corner south side of; iron post, marked "B 846"...	845.547
T. 9 N., R. 6 E., S. 16, in northwest $\frac{1}{4}$ of, 200 feet south of Lodi Mills; iron post, marked "B 734".....	734.190
T. 11 N., R. 5 E., S. 2, near center of, 100 feet north of railroad track at North Freedom; iron post, marked "B 886".....	885.841
T. 10 N., R. 5 E., S. 15, near center of, crossroads at Denzer; iron post, marked "B 803".....	803.176
T. 10 N., R. 5 E., S. 19, near $\frac{1}{2}$ corner north side of, Leland; iron post, marked "B 787".....	787.126
T. 9 N., R. 5 E., S. 8, Blackhawk; iron post, marked "B 772".....	772.096
T. 11 N., R. 4 E., S. 14, in southeast $\frac{1}{4}$ of, near stone church; iron post, marked "B 1261".....	1, 261.428
T. 9 N., R. 4 E., S. 11, $\frac{1}{2}$ corner north side of; iron post, marked "B 815"...	815.095

ROCKY MOUNTAIN SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. E. M. Douglas, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in the various localities, as follows:

SOUTHWESTERN COLORADO.

SAN JUAN, DOLORES, AND LA PLATA COUNTIES.

ENGINEER MOUNTAIN AND NEEDLE MOUNTAIN QUADRANGLES, AND RICO SPECIAL MAP.

The elevations given below are based on a bronze tablet, set in the foundation of the Smelter City State Bank Building, Durango, marked "6517."

The elevation of this datum, as derived from the corrected Denver and Rio Grande Railroad levels, is accepted as 6,517.003 feet above mean sea level.

The leveling was done under the direction of Mr. W. M. Beaman, topographer, by Mr. Thomas Winsor, levelman.

The bench marks dependent on this datum are stamped with the letters "DUR" in addition to the figures of elevation.

HERMOSA PARK TO RICO, VIA ROCKWOOD AND RICO "UPPER" ROAD.

	Feet.
Hermosa Park, 1 mile north of; in base of north side of 24-inch spruce tree south side of road on north bank of Hermosa Creek; mark, a spike.....	8, 897.33
Hermosa Park, $1\frac{1}{2}$ miles north of; top of white sandstone rock, 40 feet south of 24-inch spruce tree at mouth of west fork of Hermosa Creek; bronze tablet, marked "DUR 8986".....	8, 985.861
Hermosa Park, 4 miles northwest of; in base of northeast side of 12-inch spruce tree on southeast side of road; mark, a copper nail.....	10, 020.02
Hermosa Park, $5\frac{1}{2}$ miles northeast of; 15 feet southwest of road, at summit of divide between Hermosa Creek and Dolores River; iron post, marked "DUR 10413".....	10, 412.721

TRIANGULATION AND SPIRIT LEVELING.

421

	Feet.
Hermosa Park, 6 miles northwest of; in base of north side of 12-inch spruce tree on west side of road, 400 feet south of log bridge over ravine; mark, a copper nail	10,077.78
Rico, 6½ miles southeast of; top of red sandstone, outcrop on north side of road, 300 feet west of where road crosses to north branch of Scotch Creek; bronze tablet, marked "DUR 9247"	9,247.087
Rico, 5½ miles southeast of; in root on west side of 12-inch quaking aspen tree on east side of road at bend; mark, a copper nail	9,077.04
Rico, 4½ miles southeast of; small granite boulder, 7 feet south of road, 150 feet east of log bridge over Scotch Creek; mark, a chiseled cross ...	8,802.91
Rico, 3 miles south of; in top of conglomerate boulder, on north side of road, 150 feet east of forks of road to Durango; aluminum tablet, marked, "DUR 8538"	8,538.157
Rico, 3 miles south of; bed of Dolores River under road bridge	8,520.0
Rico, 2½ miles south of; in root, east side of 24-inch spruce stump on west side of road, 50 feet south of band stand and south end of race course; mark, a spike	8,573.05
Rico, 1½ miles south of; floor of bridge over Dolores River	8,599.0
Rico, 1 mile south of; granite boulder at forks of road, 150 feet south of south side of cemetery; mark, a chiseled cross	8,715.94
Rico, Glasgow, and Mantz avenues; ground at band stand	8,800.0
Rico, in top of west end of balustrade, at south side of main entrance to court-house; aluminum tablet, marked "DUR 8824"	8,824.167
Rico, 50 feet south of Rio Grande Southern Railroad station, and near northeast corner of small park; iron post, marked "DUR 8714"	8,713.977
Rico, floor of bridge over Dolores River, southeast of railroad station	8,711.0

RICO TO SUMMIT OF EXPECTATION MOUNTAIN.

Rico, 1 mile west of; in base of north side of quaking aspen tree on east side of road; mark, a wire nail	9,295.81
Rico, 2 miles west of; in root on north side of 16-inch spruce tree on south side of trail; mark, a copper nail	10,551.07
Rico, 3 miles west of; in root on north side of 8-inch spruce tree on ridge northeast of Expectation Mountain; mark, a copper nail	11,517.38
Expectation Mountain, summit of; in top of 15 by 15 inch embedded granite boulder 20 feet northeast of triangulation station; bronze tablet, marked "DUR 12065"	12,065.375

RIO GRANDE SOUTHERN RAILROAD, FROM RICO TO ROAD CROSSING 3 MILES SOUTH.

Milepost 67, in front of first telegraph pole south of; mark, a railroad spike	8,655.58
Trestle No. 68 A, top of rail	8,626.0
Trestle No. 68 B, top of rail	8,605.0
Milepost 68, in front of first telegraph pole north of; mark, a railroad spike	8,583.99

ROCKWOOD AND SILVERTON WAGON ROAD, FROM SUMMIT OF COAL BANK HILL TO MOLES LAKE.

Coal Bank Hill, 1½ miles northeast of; in root on east side of 12-inch spruce tree at southwest end of bridge over small creek; mark, a copper nail	10,181.0
Coal Bank Hill, 2 miles northeast of; on outcrop on west side of road at summit of steep ascent; mark, a chiseled cross	9,959.23
Coal Bank Hill, 2½ miles northeast of; in top of embedded limestone boulder on north side of road, 40 feet northeast of bridge over small creek, at point where road makes a horseshoe bend; a bronze tablet, marked "DUR 9642"	9,642.383

	Feet.
Coal Bank Hill, 3½ miles northeast of; bridge over Lime Creek.....	9,704.0
Moles Lake, 3½ miles southwest of; on a large boulder on northwest side of road on bank of small stream; mark, a chiseled cross	10,194.29
Moles Lake, 2½ miles southwest of; in top of limestone boulder 8 feet in diameter, on west side of road, 1,000 feet south of summit of hill; aluminum tablet, marked "DUR 10790"	10,789.953
Moles Lake, 1½ miles southwest of; in root on south side of 12-inch spruce tree on southeast side of road, about 500 feet north of small lake; mark, a spike	10,916.0
Moles Lake, ½ mile southwest of; in root west side of dead 16-inch spruce tree on east side of road; mark, a copper nail	10,652.24
Moles Lake, 100 feet north of log house; in top of embedded granite boulder on southeast side of Silverton and Cascade toll road; a bronze tablet, marked "DUR 10506"	10,506.488
Moles Lake, surface of	10,488.0
Moles Lake, ¼ mile northeast of; on top of granite boulder on northwest side of; nearby 12-inch spruce stump opposite Moles Mine; mark, a chiseled cross	10,449.53

DENVER AND RIO GRANDE RAILROAD (SILVERTON BRANCH), FROM 4 MILES SOUTH OF SILVERTON TO 7 MILES NORTH OF ROCKWOOD.

Milepost "D 492;" in back of telegraph pole; mark, a spike	9,103.0
Milepost "D 491," 10 feet west of; on top of granite boulder 5 feet east of track; mark, a chiseled cross	9,015.76
Trestle No. 490 A, top of rail	8,970.0
Elk Park, 1 mile north of; in top of flat boulder 350 feet north of milepost "D 490," 20 feet east of track at curve; aluminum tablet, marked "DUR 8924"	8,923.655
Elk Park, sign board at; top of rail in front of	8,868.0
Milepost "D 489," railroad spike in front of	8,867.87
Trestle No. 488 C, top of rail	8,856.0
Bridge No. 488 B, top of rail	8,838.0
Trestle No. 488 A, top of rail	8,820.0
Milepost "D 488," railroad spike in front of	8,795.55
Trestle No. 487 A, top of rail	8,783.0
Elk Park, 2 miles south of; in granite outcrop 26 feet west of track, opposite milepost "D 487;" aluminum tablet, marked "DUR 8750"	8,750.249
Milepost "D 487," railroad spike in front of	8,657.33
Trestle No. 485 A, top of rail	8,580.0
Milepost "D 485," railroad spike in front of	8,545.81
Needleton, 3 miles north of; in top of granite ledge 19 feet west of and 4½ feet below track, 200 feet south of milepost "D 484;" aluminum tablet, marked "DUR 8430"	8,429.708
Trestle No. 483 A, top of rail	8,335.0
Milepost "D 483," railroad spike in front of	8,332.97
Trestle No. 482 A, top of rail	8,250.0
Milepost "D 482," 50 feet northwest of; on granite ledge 7 feet east of track; mark, a chiseled cross	8,223.33
Needleton, ½ mile north of; in outcrop 6 feet west of track; aluminum tablet, marked "DUR 8142"	8,141.983
Needleton, in front of platform; top of rail	8,127.0
Milepost "D 480," 400 feet east of, on top of large granite boulder, 5 feet south of track; mark, a chiseled cross	8,052.15
Milepost "D 479," railroad spike in front of	7,931.15

	Feet.
Needleton, 3 miles south of; in top of granite ledge, 9 feet west of track, opposite milepost "D 478;" aluminum tablet, marked "DUR 7846".....	7,846.254
Milepost "D 477," railroad spike in front of	7,757.22
Bridge, No. 478 A, top of rail	7,707.0
Milepost "D 476," in front of second telegraph pole south of; mark, a rail- road spike.....	7,655.11

SOUTHERN TEXAS.

The leveling for the Bastrop and Llano quadrangles, having been completed, is here given in full. (See the Appendix to the eighteenth and nineteenth annual reports for other elevations in these localities.)

BASTROP, LEE, TRAVIS, WILLIAMSON, BURNET, LLANO, GILLESPIE,
KENDALL, AND BLANCO COUNTIES.

All of the following elevations depend on the San Antonio datum established in 1896, being a bronze tablet marked "661.1" at the north side of steps at east entrance to city hall, the assumed elevation of which is 661.112 feet.

The leveling was done by Mr. J. A. Hinman and Mr. Thomas Winsor, under the general direction of Mr. E. M. Douglas, geographer.

A main control line was run from Austin, via Burnet and Llano, to Comfort (Kendall County), connecting at that point with the work of 1896-97.

For other elevations in this locality see the eighteenth and nineteenth annual reports of this Survey.

All bench marks are stamped "S. A." in addition to the elevation in feet.

BASTROP QUADRANGLE.

BASTROP TO ELGIN, ALONG MISSOURI, KANSAS AND TEXAS RAILWAY.

	Feet.
Milepost 953, spike in front of.....	378.93
Bastrop, 1.66 miles north of; top of coping northeast end of East Rock Pier, Piney Creek; copper bolt, marked "S. A. 365".....	365.488
Piney Creek, bed of.....	324.0
Trestle No. 2036, top of tie.....	393.5
Milepost 951, spike in front of.....	417.05
Trestle No. 2035, top of tie.....	436.2
Trestle No. 2034, top of tie.....	445.3
Milepost 950, spike in front of.....	434.95
Trestle No. 2033, top of tie.....	439.9
Bastrop, 4½ miles north of; 3 feet outside of southeast corner of right-of- way fence at the crossing of the Bastrop and Elgin public road; iron post, marked "S. A. 460".....	460.656
Trestle No. 2032, top of tie.....	457.6
Trestle No. 2031, top of tie.....	461.0
Trestle No. 2030, top of tie.....	478.0
Trestle No. 2029, top of tie.....	483.0
Milepost 948, spike in fourth telegraph pole south of	488.87
Trestle No. 2028, top of tie.....	488.6
Trestle No. 2027, top of tie.....	488.6

	Feet.
Trestle No. 2026, top of tie.....	503. 6
Milepost 947, spike in front of.....	502. 29
Trestle No. 2025, top of tie.....	481. 8
Trestle No. 2024, top of tie.....	471. 4
Milepost 946, spike in back of.....	475. 82
Trestle No. 2023, top of tie.....	471. 3
Trestle No. 2022, top of tie.....	464
Bastrop, 8½ miles north of; 5 feet east of northwest corner of right-of-way fence at public road crossing, 4½ telegraph poles south of milepost 945; iron post, marked "S. A. 449".....	448. 956
Trestle No. 2021, top of tie.....	439. 8
Trestle No. 2020, top of tie.....	412. 3
Trestle No. 2019, top of tie.....	406. 1
Trestle No. 2018, top of tie.....	400. 2
Trestle No. 2017, top of tie.....	401. 5
Milepost 944, spike in back of seventh telegraph pole north of.....	412. 13
Sayers station, center of main track opposite platform.....	415. 2
Trestle No. 2016, top of tie.....	411. 3
Milepost 943, spike in back of.....	402. 79
Main Sandy Creek, bed of.....	381. 0
Trestle No. 2014, top of tie.....	438. 3
Cary Lacier coal mine spur, center of track at head block of.....	459. 9
Bastrop, 12½ miles north of; 650 feet north of head block of Cary Lacier coal mine spur, 35 feet west of center of track at road crossing; iron post, marked "S. A. 468".....	468. 050
Trestle No. 2012, top of tie.....	463. 5
Trestle No. 2011, top of tie.....	459. 6
Milepost 941, spike in front of.....	461. 99
Trestle No. 2009, top of tie.....	468. 7
Trestle No. 2008, top of tie.....	483. 6
Milepost 940, spike in back of.....	518. 63
Milepost 939, spike in front of first telegraph pole north of.....	557. 41
Trestle No. 2007, top of tie.....	570. 7
Trestle No. 2006 A, top of tie.....	561. 5
Milepost 938, spike in back of.....	560. 71
Trestle No. 2006, top of tie.....	551. 8
Bastrop, 6½ miles north of; 15 feet northeast of the southwest corner of right-of-way fence, 20 feet west of center of track at Bastrop and Elgin road crossing; iron post, marked "S. A. 530".....	530. 089
Little Sandy Creek, bed of.....	487. 0
Mile post 936, spike in back of first telegraph pole south of.....	548. 33
Trestle No. 2003 A, top of tie.....	562. 0
Section house, center of track in front of.....	570. 1
Elgin, at Union passenger station, 7 feet east of southeast corner of small park, 115 feet east of crossing of Missouri, Kansas and Texas, and the Houston and Texas Central Railroads, 20 feet north of Houston and Texas Central Railroad main track; iron post, marked "S. A. 576"	576. 042
ELGIN TO GIDDINGS, ALONG THE HOUSTON AND TEXAS CENTRAL RAILROAD.	
Section house No. 14, center of track in front of.....	576. 6
Milepost 87, spike in back of second telegraph pole southeast of.....	570. 47
Elgin, 2½ miles southeast of; 15 feet east of northwest corner of right-of- way fence at the crossing of the Elgin and McDade public road, and 5 feet northwest of 18-inch post oak tree at intersection of lane; iron post, marked "S. A. 566".....	565. 964
Milepost 85, spike in back of second telegraph pole northwest of.....	533. 81

	Feet.
Trestle No. 195, center of track	530. 7
Sand spur, head block of; center of track	539. 4
Milepost 84, spike in back of second telegraph pole northwest of	539. 41
Section house No. 13, center of track in front of	518. 5
Milepost 83, spike in front of sixth telegraph pole southeast of	516. 595
Elgin, 5½ miles southeast of; 100 feet south of railroad at intersection of a settlement road with the Elgin and McDade public road, 650 feet east of section house No. 13; iron post, marked "S. A. 517"	517. 094
Milepost 82, spike in back of telegraph pole, 10 feet west of	472. 95
Sandy Creek, bed of	426. 0
Milepost 81, spike in front of third telegraph pole southeast of	487. 455
Coal mine spur, head block at; center of track	492. 0
Milepost 80, spike in front of sixth telegraph pole southeast of	530. 26
Milepost 79, spike in front of first telegraph pole southeast of	523. 24
Milepost 78, spike in front of first telegraph pole southeast of	554. 597
McDade, center of track in front of passenger station	566. 1
McDade, 50 feet north of northeast corner of passenger station; iron post, marked "S. A. 568"	568. 007
Section house No. 12, center of track in front of	567. 3
Milepost 76, spike in back of first telegraph pole southeast of	566. 18
McDade, 2 miles southeast of; top of rock masonry wall around southwest end of 24-inch drainpipe culvert, 250 feet southeast of the crossing of the McDade and Paige public road; copper bolt, marked "S. A. 588" ...	588. 517
Milepost 75, spike in back of telegraph pole 15 feet south of	616. 20
Milepost 74, spike in front of first telegraph pole southeast of	600. 70
Milepost 73, spike in front of first telegraph pole northwest of	552. 98
Trestle No. 164, center of track	548. 0
Milepost 72, spike in front of second telegraph pole southeast of	515. 41
McDade, 6 miles southeast of; halfway between mileposts 71 and 72, northeast face of brick retaining wall built around double 24-inch drain- pipe culvert; bronze tablet, marked "S. A. 495"	495. 148
Paint Creek, bed of	496. 0
Milepost 70, spike in front of first telegraph pole northwest of	539. 64
McDade, 8½ miles southeast of; 150 feet southwest of the McDade and Paige public road crossing and 250 feet northwest of milepost 69, verti- cal side of brick coping on wing wall south end of 24-inch drain-pipe cul- vert No. 157; bronze tablet, marked "S. A. 578"	578. 221
Milepost 68, spike in back of telegraph pole 25 feet southwest of	560. 15
Paige, 180 feet northeast of passenger station; 7 feet east of northeast corner of small park; iron post, marked "S. A. 549"	549. 363
Paige, center of track in front of passenger station	552. 0
Section house No. 11, center of track in front of	552. 0
Milepost 66, spike in back of first telegraph pole southeast of	546. 75
Milepost 65, spike in front of fourth telegraph pole northwest of	541. 43
Paige, 3 miles southeast of; 7½ telegraph poles northwest of milepost 64, 10 feet of southeast corner of right-of-way fence at the crossing of the Paige and Giddings public road, 38 feet south of center of track; iron post, marked "S. A. 528"	528. 157
Section house No. 10, center of track in front of	552. 0
Milepost 63, spike in front of first telegraph pole southeast of	553. 15
Milepost 62, spike in front of first telegraph pole northwest of	541. 89
Milepost 61, spike in back of first telegraph pole northwest of	539. 91
Paige, 7 miles southeast of; about ¼ mile southeast of milepost 61, top of rock coping over south end of 18-inch drainpipe culvert; copper bolt, marked "S. A. 520"	520. 024

	Feet.
Milepost 60, spike in front of first telegraph pole southwest of	520.80
Milepost 59, spike in front of first telegraph pole southeast of	503.22
Milepost 58, spike in front of first telegraph pole east of	490.70
Paige, 9 $\frac{1}{4}$ miles southeast of; about halfway between mileposts 57 and 58, top of rock coping over southeast end of 18-inch drainpipe culvert No. 132; copper bolt, marked "S. A. 487"	486.978
Section house No. 9, center of track in front of	506.0
Giddings, center of track at the crossing of the Houston and Texas Cen- tral Railroad and the Waco branch of the San Antonio and Aransas Pass Railway	512.3
Giddings, Lee County court-house; northeast corner of; bronze tablet, marked "S. A. 520"	520.424

GIDDINGS TO WINCHESTER, ALONG SAN ANTONIO AND ARANSAS PASS RAILWAY.

Trestle No. 208, top of tie	495.3
Trestle No. 207, top of tie	464.8
Milepost 184, spike in front of	454.85
Trestle No. 206, top of tie	449.9
Trestle No. 205, top of tie	449.6
Trestle No. 204, top of tie	449.9
Trestle No. 203, top of tie	443.1
Milepost 183, spike in back of	441.95
Giddings, 2 $\frac{1}{4}$ miles south of; in lane on west side of Giddings and Winches- ter public road, 35 feet south of south bank of Rabbs Creek and 50 feet west of center of track; iron post, marked "S. A. 404"	404.450
Rabbs Creek, bed of	385.0
Trestle No. 200, top of tie	406.6
Trestle No. 199, top of tie	409.6
Trestle No. 198, top of tie	421.6
Trestle No. 197, top of tie	420.1
Milepost 181, spike in back of	410.02
Trestle No. 194, top of tie	416.8
Trestle No. 192, top of tie	432.7
Trestle No. 191, top of tie	436.1
Milepost 180, spike in back of first telegraph pole south of	442.04
Trestle No. 189, top of tie	468.2
Trestle No. 188, top of tie	479.5
Serbin, 50 feet southeast of passenger station; 12 feet east of center of main track and 12 feet north of wagon road; iron post, marked "S. A. 482"	482.512
Trestle No. 185, top of tie	464.5
Milepost 178, spike in back of	449.19
Trestle No. 183, top of tie	434.8
Milepost 177, spike in front of	433.09
Trestle No. 180, top of tie	432.9
Trestle No. 179, top of tie	435.9
Giddings, 8 $\frac{1}{4}$ miles south of; northwest corner of right-of-way fence, 70 feet northwest of the Giddings and Winchester public-road crossing; iron post, marked "S. A. 448"	448.548
Trestle No. 177, top of tie	434.9
Milepost 175, spike in front of first telegraph pole south of	418.77
Trestle No. 175, top of tie	420.3
Trestle No. 174, top of tie	420.1
Milepost 174, spike in back of first telegraph pole north of	415.47
Trestle No. 170, top of tie	406.2
Trestle No. 169, top of tie	412.1

TRIANGULATION AND SPIRIT LEVELING.

427

	Feet.
Giddings, 11½ miles south of; northwest corner of right-of-way fence, 42 feet northwest of the Giddings and Winchester public-road crossing, 33 feet west of center of track; iron post, marked "S. A. 400".....	400.534
Trestle No. 166, top of tie	394.9
Trestle No. 165, top of tie	378.2
Trestle No. 163, top of tie	353.5
Milepost 172, spike in back of	343.87
Winchester, center of track in front of passenger station	338.3
Winchester, 50 feet north of passenger station; 45 feet east of middle of main track; iron post, marked "S. A. 335"	335.554

WINCHESTER AND ALUM CREEK, VIA LAGRANGE AND BASTROP PUBLIC ROAD.

Pin Oak Creek, east fork, bed of	276.0
Winchester, 2½ miles west of; spike in corner fence post south side of road, at mouth of lane	334.0
Winchester, 3 miles west of; east side of Pin Oak Creek, forks of road to Hodgins Ford of Colorado River; iron post, marked "S. A. 300".....	300.708
Pin Oak Creek, bed of.....	285.0
Winchester, 5½ miles west of; forks of the Lagrange and Bastrop public road and a public road leading to Smithville, via Hodgins Ford of Colorado River; iron post, marked "S. A. 364".....	364.638
Winchester, 7½ miles west of; spike in front of 18-inch post, oak tree 20 feet north of road, wire fence nailed to tree.....	463.03
Winchester, 8½ miles west of; 1 mile east of J. D. Creek, 75 feet east of forks of the Lagrange and Bastrop public road and a public road leading to Smithville, via Eblin Ford of Colorado River; iron post, marked "S. A. 349".....	349.898
J. D. Creek, bed of	291.0
Winchester, 9½ miles west of; spike in front of 20-inch elm tree, 50 feet south of road, 300 feet west of J. D. Creek.....	312.51
Winchester, 11½ miles west of; 9 feet east of 24-inch pecan used as fence corner post, 15 feet northwest of intersection of Smithville and Bastrop, and Lagrange and Bastrop public roads, about 1½ miles north of Smithville; iron post, marked "S. A. 331"	331.791
Winchester, 13 miles west of; at mouth of Jones's lane leading to Colorado River, 10 feet south of the middle of main road; iron post, marked "S. A. 343"	343.717

NORTHEASTERLY ON BASTROP AND GIDDINGS PUBLIC ROAD.

Coparas Creek, bed of.....	433.0
Bastrop, 4½ miles northeast of; 35 feet northeast of forks of road, 100 feet west of small prairie; iron post, marked "S. A. 528"	527.881
Bastrop, 6½ miles northeast of; spike in front of 14-inch post-oak tree, 4 feet south of road.....	403.74
Alum Creek, bed of.....	366.0

ALUM CREEK AND PAIGE PUBLIC ROAD.

Bastrop, 9½ miles northeast of; spike in root of 22-inch post-oak tree, 50 feet south of the crossing of the Alum Creek and Paige and Bastrop and Giddings public roads.....	541.18
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NORTHEASTERLY ALONG BASTROP AND GIDDINGS PUBLIC ROAD.

Gravelly Creek, west branch, bed of.....	460.0
Gravelly Creek, bed of.....	460.0
Bastrop, 12 miles northeast of; east bank of Gravelly Creek, 20 feet south of main road and 30 feet east of middle of creek; iron post, marked "S. A. 466"	465.993

	Feet.
Bastrop, 15½ miles northeast of; 800 feet northeast of the Pin Oak Creek crossing, 12 feet north of road, 15 feet northwest of field fence-corner; iron post, marked "S. A. 414"	414. 002
Pin Oak Creek, bed of	388. 0
Grassy Creek, bed of	424. 0
Bastrop, 18½ miles northeast of; 50 feet northeast of the intersection of the Serbin road and 50 feet northeast of the Bastrop and Lee county line, and at northeast fence corner; iron post, marked "S. A. 476"	475. 901
Bastrop, 19¼ miles northeast of; spike in front of 14-inch post-oak tree, 2 feet north of road opposite painted two-story house	510. 93
Bastrop, 21 miles northeast of; 30 feet south of crossroads, 1,000 feet west of Rabbs Creek; iron post, marked "S. A. 475"	474. 833
Rabbs Creek, bed of	449. 0
Bastrop, 23¼ miles northeast of; 15 feet north of main road, 50 feet west of road crossing small branch and west of Houston and Texas Central Railroad; iron post, marked "S. A. 461"	460. 745
GIDDINGS TO LEXINGTON, VIA SAN ANTONIO AND ARANSAS PASS RAILWAY.	
Trestle No. 210, top of tie	492. 2
Milepost 186, spike in back of telegraph pole	483. 49
Trestle No. 213, top of tie	453. 1
Giddings, 1¼ miles north of; southwest corner of right-of-way fence, 55 feet southwest of crossing of the Giddings and Lexington public road, 3½ telegraph poles south of mile post 187; iron post, marked "S. A. 435"	434. 658
Nails Creek, bed of	377. 0
Milepost 188, spike in front of telegraph pole	398. 44
Trestle No. 216, top of tie	425. 6
Giddings, 3¼ miles north of; 45 feet southwest of crossing of Giddings and Caldwell public road, 3 feet north of fence; iron post, marked "S. A. 427"	426. 727
Trestle No. 218, top of tie	425. 5
Trestle No. 219, top of tie	431. 7
Trestle No. 220, top of tie	424. 0
Milepost 190, spike in back of telegraph pole	412. 34
Trestle No. 223, top of tie	406. 3
Trestle No. 224, top of tie	395. 5
Trestle No. 226, top of tie	384. 8
Trestle No. 227, top of tie	379. 5
Milepost 191, spike in front of first telegraph pole north of	365. 47
Elm Creek, bed of	335. 0
Milepost 192, spike in back of telegraph pole	367. 49
Trestle No. 232, top of tie	355. 5
Trestle No. 234, top of tie	551. 4
Lincoln, 70 feet northeast of passenger station, 22 feet east of main track; iron post, marked "S. A. 367"	366. 662
West Yegua Creek, bed of	340
Trestle No. 238, top of tie	369. 3
Milepost 104, spike in back of telegraph pole	370. 84
Trestle No. 240, top of tie	380. 9
Lincoln, 1½ miles north of; 65 feet southeast of the Lincoln and Fedor public-road crossing, 45 feet east of track, 3 feet northwest of the south-east corner of right-of-way fence; iron post, marked "S. A. 381"	380. 643
Trestle No. 241, top of tie	403. 6
Trestle No. 242, top of tie	421. 6
Milepost 196, spike in front of telegraph pole	424. 35
Trestle No. 244, top of tie	415. 2

TRIANGULATION AND SPIRIT LEVELING.

429

	Feet.
Trestle No. 245, top of tie.....	406. 7
Milepost 197, spike in front of telegraph pole	404. 43
Trestle No. 246, top of tie.....	372. 0
Milepost 198, spike in back of telegraph pole	357. 94
Middle Yegua Creek, bed of	337. 0
Lincoln, 5½ miles north of; 50 feet southeast of the Giddings and Lexington public road, 850 feet north of Middle Yegua Creek; iron post, marked "S. A. 348"	347. 627
Trestle No. 249, top of tie.....	360. 4
Trestle No. 250, top of tie.....	375. 4
Trestle No. 251, top of tie.....	371. 6
Milepost 200, spike in front of telegraph pole	380. 46
Trestle No. 253, top of tie.....	387. 9
Trestle No. 254, top of tie.....	389. 7
Milepost 201, spike in front of telegraph pole.....	407. 23
Trestle No. 257, top of tie	428. 8
Milepost 202, spike in back of telegraph pole.....	436. 98
Trestle No. 259, top of tie.....	438. 1
Lexington, ¼ mile east of the passenger station; 45 feet south of the crossing of the Giddings and Lexington public road; iron post, marked "S. A. 465"	464. 654

LEXINGTON TO PERMANENT BENCH MARK NO. 70, VIA FEDOR AND PAIGE—LEXINGTON AND FEDOR PUBLIC ROAD.

Lexington, 1¼ miles southwest of; 35 feet southwest of the intersection of a road connecting the Lexington and Fedor and the Lexington and McDade public roads; iron post, marked "S. A. 402".....	401. 645
Lexington, 3¼ miles southwest of; spike in back of 18-inch elm tree, 50 feet north of Middle Yegua Creek, 20 feet southeast of angle in road	359. 24
Middle Yegua Creek, bed of	351. 0
Lexington, 4¼ miles southwest of; 70 feet south of the intersection of the Lexington and Fedor and Lexington and Giddings upper public road, 1,900 feet south of the crossing of Middle Yegua Creek; iron post, marked "S. A. 368"	367. 694
Lexington, 6¼ miles southwest of; spike in front of 20-inch post-oak tree, 15 feet west of middle of road at angle in same.....	443. 93
Lexington, about 7 miles southwest of; spike in front of 10-inch post-oak tree, 10 feet south of intersection of roads	444. 56
Fedor, 1,000 feet north of store at; 50 feet south of forks of Lexington and Fedor and Fedor and Austin public roads; iron post, marked "S. A. 424"	423. 742

WESTWARD ALONG FEDOR AND AUSTIN PUBLIC ROAD.

Fedor, 2¼ miles west of; at intersection of the Fedor and Austin and the Giddings and Taylor public roads, 1,550 feet north of West Yegua Creek; iron post, marked "S. A. 453"	452. 566
West Yegua Creek, bed of.....	391. 0
Fedor, 3¼ miles west of; spike in front of 18-inch post-oak tree, 20 feet west of road, 250 feet south of forks of road.....	432. 85

SOUTHWESTERLY ALONG SETTLEMENT ROAD.

Fedor, 4¼ miles southwest of; spike in back of leaning post-oak tree, 20 feet northwest of fence corner at mouth of lane	460. 16
Fedor, 5½ miles southwest of; 40 feet northeast of the intersection of roads, at gate; iron post, marked "S. A. 520"	519. 664

SOUTHWESTERLY ALONG PAIGE AND UPPER LEXINGTON PUBLIC ROAD.		Feet.
Paige, 3 miles northeast of; 65 feet northeast of the intersection of the Upper Lexington road and the Paige and Darden Springs public road; iron post, marked "S. A. 531"		530. 826
SOUTHWESTERLY ALONG OLD SAN ANTONIO ROAD FROM PAIGE.		
Paige, $\frac{1}{2}$ mile west of; spike in back of telegraph pole near southeast corner of right-of-way fence at crossing of Old San Antonio and Paige, and McDade public roads		557. 38
Paige, $1\frac{1}{4}$ miles southwest of; $1\frac{1}{2}$ feet east of west fence line and 150 feet north of summit of ridge; iron post, marked "S. A. 611"		610. 665
Paige, 3 miles southwest of; spike in fence corner post at mouth of lane entrance to church grounds		588. 86
Paige, $4\frac{1}{2}$ miles southwest of; spike in front of north gatepost, west side of road		584. 05
Paige, $4\frac{1}{2}$ miles southwest of; 30 feet south of mouth of lane, 2 feet west of east fence line; iron post, marked "S. A. 535"		534. 687
Little Alum Creek, bed of		480. 0
Paige, $7\frac{1}{4}$ miles southwest of; forks of the old San Antonio and the Giddings public roads; iron post, marked "S. A. 455"		454. 787
Alum Creek, bed of		436. 0
WESTERLY ALONG BASTROP AND CEDAR CREEK ROAD FROM PERMANENT BENCH MARK NO. 72 TO CEDAR CREEK.		
Cedar Creek post-office, $4\frac{1}{2}$ miles east of; spike in south side of 20-inch post-oak tree, 85 feet south of east fence corner in middle of road		439. 74
Cedar Creek post-office, $3\frac{1}{2}$ miles east of; forks of Bastrop and Cedar Creek road with road leading to Winson's gin, 20 feet east of 36-inch post-oak tree; iron post, marked "S. A. 446"		445. 996
Green's Creek, bed of		420. 0
Harvey's Creek, bed of		393. 0
Cedar Creek post-office, $1\frac{1}{2}$ miles east of; spike in south side 33-inch post-oak tree in middle of road, $\frac{1}{2}$ mile west of Harvey's Creek		432. 64
Cedar Creek post-office, 400 feet south of; 19 feet south of southeast fence corner at forks of Bastrop and Cedar Creek road with Austin and Port Lavaca road; iron post, marked "S. A. 445"		445. 240
ALONG AUSTIN AND PORT LAVACA ROAD FROM CEDAR CREEK POST-OFFICE SOUTHWARD TO REDROCK.		
Cedar Creek post-office, $\frac{1}{2}$ mile south of; on most northern bolt top of northwest caisson of bridge over Cedar Creek		411. 62
Cedar Creek, bed of		392. 0
Cedar Creek post-office, $1\frac{1}{4}$ miles south of; spike in 18-inch dead post-oak tree at forks of roads		486. 31
Cedar Creek post-office, $2\frac{1}{2}$ miles south of; spike in east side of 20-inch post-oak tree, 15 feet west of east fence line in front of corral		507. 26
Cedar Creek post-office, 4 miles south of; spike in fence cornerpost at point where road makes right angle bend		471. 77
Cedar Creek post-office, 5 miles south of; on northerly side of Austin and Port Lavaca road at point where road makes a sharp bend, 4 feet west of 20-inch post-oak tree; iron post, marked "S. A. 472"		472. 118
Cedar Creek post-office, 6 miles south of; spike in east side 16-inch pin-oak tree, west side of road, opposite southwest corner of a cultivated field		424. 90
Cedar Creek post-office, $6\frac{1}{2}$ miles south of; spike in post-oak stump, east side of road, at forks with Bastrop and Redrock road		404. 06

TRIANGULATION AND SPIRIT LEVELING.

431

	Feet.
Walnut Creek bridge, on most easterly bolt on top of southeast caisson of.	385.90
Walnut Creek, bed of	361.0
Redrock, 4½ miles north of; at forks of Austin and Port Lavaca road with old road to Redrock, ¼ mile northwest of Walnut Creek Catholic Church, 6 feet southeast of 24-inch dead post-oak tree utilized as fence corner-post; iron post, marked "S. A. 478"	478.467
Redrock, 3¼ miles north of; ½ mile southeast of Walnut Creek Catholic Church; spike in root north side of 20-inch dead post-oak tree in middle of road	480.57
Redrock, 2½ miles north of; spike in root east side of 16-inch post-oak tree west side of road, 400 feet north of forks of roads	532.50
Redrock, 1½ miles north of; spike in west side of 22-inch post-oak tree in middle of road at square turn	481.17

NORTHEASTERLY ALONG BASTROP AND REDROCK PUBLIC ROAD FROM INTERSECTION WITH AUSTIN AND PORT LAVACA ROAD.

Bastrop, 8½ miles southwest of; at forks of Bastrop and Redrock road with a settlement road, 40 feet east of fence line, 200 feet north of house with log chimney; iron post, marked "S. A. 477"	477.119
Cedar Creek, bed of long branch of	362.0
Bastrop, 6½ miles southwest of; spike in north root of 18-inch post-oak tree, east side of road, about ¼ mile north of long branch of Cedar Creek.	396.36
Cedar Creek bridge, most westerly bolt on top of southwest caisson of...	366.93
Cedar Creek, bed of	343.0
Bastrop, 4½ miles southwest of; spike in south side of post-oak stump, north side of road opposite a filled rail and wire-fence corner	457.17
Bastrop, 3½ miles southwest of; at intersection of Bastrop and Redrock road with settlement roads, 3 feet south of northeast fence, 45 feet southeast of gate; iron post, marked "S. A. 384"	384.176
Bastrop, 2½ miles southwest of; spike in root of 24-inch elm tree, south side of road on right bank of Colorado River	357.77
Bastrop, 1½ miles southwest of; staple in root on south side of 24-inch oak stump in middle of road, nearly opposite to house on south side of road.	361.30
Bastrop bridge, west end of; spike in root of 18-inch elm tree on north side of road	364.72

NORTHWESTERLY ALONG BASTROP AND AUSTIN ROAD FROM FORKS WITH OLD SAN ANTONIO ROAD.

Bastrop, 5 miles northwest of; spike in cedar fencepost on north side of road, 100 feet west of bend in road, 11 feet west of 14-inch hackberry tree inside of fence	377.38
Goodman post-office, ¼ mile southeast of; spike in west gatepost at lane leading to one-story frame dwelling about 300 feet distant on south side of road	389.32
Nash's Ferry, 300 feet north of; on east side of road, 150 feet east of right bank of Colorado River, 5 feet north of 16-inch elm tree; iron post, marked "S. A. 372"	371.805
Colorado River, bed of at Nash's Ferry	345.0
Nash's Ferry, 2 miles north of; spike in root on south side of 15-inch post-oak tree on west side of road, 250 feet southeast of negro schoolhouse...	422.05
Colorado Chapel, 500 feet north of; staple in top of 6-inch post at forks of Bastrop and Austin road with Elgin and Coats road	437.11

NORTHEASTERLY ALONG ELGIN AND COATS ROAD.		Feet.
Colorado Chapel, 1 mile northeast of; spike in root on north side of 15-inch post-oak tree south of middle of road, at point where road is fenced on both sides		396. 17
Coats bridge over Wilbarger Creek, floor of		384. 3
Wilbarger Creek, bed of		353. 0
Sayers, 6 miles west of; 40 feet southeast of forks of Elgin and Coats road with Bastrop road, 800 feet northeast of Coats bridge over Wilbarger Creek; iron post, marked "S. A. 391"		391. 156
ALONG BASTROP ROAD AND SAYERS SETTLEMENT ROAD FROM ELGIN AND COATS ROAD TO SAYERS.		
Sayers, 5 miles west of; spike in root of 15-inch oak stump, south side of settlement road about 100 feet from rail-fence corner		452. 86
Sayers, 4 miles west of; spike in root on east side of 18-inch post-oak tree, 13 feet west of wire-fence corner		498. 29
Sayers, $\frac{3}{4}$ mile west of; spike in root on north side of 15-inch post-oak tree south side of road, 250 feet east of negro cabin		412. 51
Sandy Creek, bed of		375. 0
EASTWARD ALONG SAYERS AND M'DADE ROAD FROM SAYERS TO M'DADE.		
Sayers, $2\frac{1}{4}$ miles east of; spike in crotch between northern and middle trunks of triplet post-oak tree in middle of road, 350 feet east of wire-fence corner on north side of road		523. 83
Sayers, $3\frac{1}{2}$ miles east of; at forks of McDade and Sayers road with Elgin road, 250 feet west of small bridge over ravine and on north side of road; iron post, marked "S. A. 514"		514. 119
Sayers, $4\frac{1}{2}$ miles northeast of; spike in root on south side of 14-inch post oak tree, northwest side of road, 125 feet northeast of southeast corner of cultivated field		471. 14
McDade, $2\frac{1}{4}$ miles southwest of; spike in west side of gatepost, near circular corral at square bend in road		491. 3
McDade, 2 miles southwest of; east side of McDade and Sayers road, at bend opposite wire-fence corner; iron post, marked "S. A. 504"		504. 073
McDade, 1 mile southwest of; nail in root on west side of 16-inch post-oak tree on east side of road, 200 feet southwest of wire-fence corner on west side of road		569. 35
NORTHWESTERLY ALONG DARDEN SPRINGS AND PAIGE ROAD, FROM LEXINGTON UPPER ROAD TO BASTROP AND CALDWELL ROAD.		
Paige, 4 miles north of; spike in root on east side of 21-inch post-oak tree on west side of road, at bend in road		550. 52
Paige, 5 miles northwest of; spike in crotch between northern and eastern trunks of triple post-oak tree on east side of road, 120 feet north of forks with a settlement road leading off westerly		520. 21
Paige, $6\frac{1}{4}$ miles northwest of; at forks of Darden Springs and Paige road with a settlement road leading off southwesterly; iron post, marked "S. A. 498"		497. 779
Darden Springs, $1\frac{1}{2}$ miles southeast of; spike in root on west side of 7-inch post-oak tree on east side of road, about 100 feet north of north edge of small clearing		449. 39
Third Yegna Creek, bed of		407. 0
Darden Springs, Wooley branch at; bed of		428. 0
Darden Springs, 8 feet east of Dr. Darden's east gatepost, on south side of road, opposite to point where road turns northward; iron post, marked "S. A. 444"		443. 730

TRIANGULATION AND SPIRIT LEVELING.

433

NORTHEASTERLY ALONG BASTROP AND CALDWELL ROAD TO TAYLOR AND GIDDINGS ROAD.

	Feet.
Darden Springs, 1 mile northeast of; spike in south side of 14-inch post-oak tree, north side of road, 300 feet west of rail-fence corner at west edge of cultivated field	483. 11
Darden Springs, 2 miles northeast of; spike in top of 21-inch post-oak stump on north side of road, 300 feet east of wire-fence corner inclosing cultivated field	472. 05

NORTHWESTERLY ALONG TAYLOR AND GIDDINGS ROAD TO SETTLEMENT ROAD, $\frac{1}{2}$ MILE SOUTH OF BLUE POST-OFFICE.

Darden Springs, 3 miles northeast of; spike in root on south side of 22-inch post-oak tree in middle of road, $\frac{1}{2}$ mile northwest of intersection with Bastrop and Caldwell road	434. 14
Darden Springs, 4 miles north of; 1 mile northwest of intersection with Bastrop and Caldwell road, at forks with a settlement road; iron post, marked "S. A. 499"	498. 744
Blue post-office, $4\frac{1}{2}$ miles southeast of; spike in root on north side of 22-inch post-oak tree on south side of road, at point where road makes a bend	521. 99
Blue post-office, $3\frac{1}{2}$ miles southeast of; spike in root on east side of south trunk of twin post-oak trees, southwest side of road, 100 feet west of point where a private road leads off northward	516. 98
Blue post-office, 2 miles south of; forks of Taylor and Giddings road, with a private road leading off southeasterly, 25 feet north of mile board, marked "Gid. 18 M"; iron post, marked "S. A. 511"	510. 693
Blue post-office, $1\frac{1}{2}$ miles south of; spike in root on north side of 14-inch post-oak tree, southwest side of road at intersection with settlement road	488. 03

EASTWARD ALONG AUSTIN AND LEXINGTON ROAD FROM SETTLEMENT ROAD, $\frac{1}{2}$ MILE WEST OF CENTER POINT CHAPEL TO INTERSECTION WITH TAYLOR-GEORGETOWN ROAD.

Center Point Chapel, $\frac{1}{2}$ mile west of; southwest corner of forks of Austin and Lexington road with a settlement road leading off southward; iron post, marked "S. A. 487"	486. 834
Second Yegua Creek, floor of bridge over	391. 0
Second Yegua Creek, bed of	379. 0
Center Point Chapel, $3\frac{1}{2}$ miles east of; south side of road, 10 feet east of wire-fence corner at forks with a settlement road leading southward; iron post, marked "S. A. 397"	396. 895
Lexington, 4 miles west of; spike in root on south side of 22-inch post-oak tree, south side of road, 50 feet from wire-fence corner	408. 89
Big Creek bridge, floor of	392. 0
Big Creek, bed of	384. 0
Lexington, $3\frac{1}{2}$ miles west of; spike in root on north side of 20-inch pin-oak tree, south side of road, 200 feet east of Big Creek and utilized as milepost "Lexington 3 mil"	388. 15
Lexington, 2 miles west of; forks of Austin and Lexington road with Taylor-Georgetown road, 50 feet west of a post-oak tree utilized as a milepost "Lexington 2 mil"; iron post, marked "S. A. 464"	463. 930

NORTHWESTERLY ALONG TAYLOR-GEORGETOWN ROAD TO ELGIN AND LEXINGTON PUBLIC ROAD.

Lexington, $2\frac{1}{2}$ miles northwest of; spike in north side of 13-inch post-oak tree utilized as fence cornerpost, south side of forks with a settlement road leading southwesterly	448. 23
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	Feet.
Lexington, 4 miles northwest of; spike in root on north side of 16-inch post-oak tree, southwest side of road, 100 feet northwest of private road leading westerly	470. 83
Lexington, 5 miles northwest of; spike in root on east side of 16-inch post-oak tree on south side of road, at forks with settlement road leading southeasterly	494. 70
Lexington, 5½ miles northwest of; forks of Taylor-Georgetown road with Rockdale public road, 40 feet northeast of a 4-inch post-oak tree utilized as a guide post; iron post, marked "S. A. 471"	470. 986
Lexington, 7 miles northwest of; spike in base of 20-inch post-oak tree, south side of road about ¼ mile west of farmhouse standing 500 feet north of road	473. 25
Lexington, 8 miles northwest of; spike in base on north side of 14-inch post-oak tree, northwest side of road, 1,000 feet northwest of farmhouse on southwest side of road	440. 13
Walleye Creek bridge, floor of	414. 0
Walleye Creek, bed of	405. 0
Florence schoolhouse, ¼ mile east of; forks of Taylor-Georgetown road and Beankiss "cut-off" road, 500 feet southwest of intersection with Elgin and Lexington road; iron post, marked "S. A. 469"	469. 020
WESTWARD AND SOUTHWARD ALONG ELGIN AND LEXINGTON ROAD TO ELGIN.	
Florence schoolhouse, ¼ mile west of; spike in base west side of 12-inch pin-oak tree, east side of road, 200 feet northeast of bridge across Frost Creek	420. 72
Frost Creek bridge, floor of	422. 5
Frost Creek, bed of	410. 0
Florence schoolhouse, 2½ miles west of; at forks of Elgin and Lexington road with crossroad to Taylor-Georgetown road, 125 feet east of square bend in road from west to south; iron post, marked "S. A. 472"	472. 519
Beaukiss, 2½ miles east of; at west forks of Elgin and Lexington road with Taylor and Giddings road, 5 feet southwest of milepost "14 Mi. to Elgin," alongside southeast fence line; iron post, marked "S. A. 551" ..	550. 586
Beaukiss, 1 mile northeast of; spike in root on west side of 10-inch post-oak tree, north side of road, at forks with road to Rochdale, 8 feet east of 10-inch post-oak tree utilized as post for milepost "Rochdale 2½ miles".	538. 61
Beaukiss, 2½ feet east of southeast corner of Oliver's general store and post-office, on north side of Elgin and Lexington road; iron post, marked "S. A. 502"	501. 821
ELGIN AND LEXINGTON ROAD.	
Beaukiss, 2 miles southwest of; spike in root on north side of 24-inch post-oak tree on southeast fence line, 300 feet southwest of northwest corner of cultivated field	488. 15
Beaukiss, 3½ miles southwest of; 200 feet southeast of Siloam schoolhouse, 8 feet east of southeast corner of forks of roads; iron post, marked "S. A. 497"	496. 779
Beaukiss, 4½ miles southwest of; spike in base north side of 14-inch post-oak tree, 3 feet north of southeast fence line, 150 feet northeast of a cultivated field	506. 35
Elgin, 5½ miles northeast of; 10 feet southwest of northwest fence corner, at forks of Elgin and Lexington road with a road to Taylor; iron post, marked "S. A. 589"	588. 936
Elgin, 4½ miles northeast of; spike in root on southeast side of 18-inch post-oak tree near middle of road, 500 feet southwest of forks with McDade and Taylor road	565. 77

TRIANGULATION AND SPIRIT LEVELING.

435

	Feet.
Rattlesnake Creek bridge, floor of.....	544.0
Rattlesnake Creek, bed of.....	535.0
Elgin, 3 miles northeast of; tack in root on northwest side of 22-inch elm tree southeast side of road, southwest bank of Rattlesnake Creek.....	541.70
Elgin, 2½ miles northeast of; 500 feet east of Redtown schoolhouse, 3 feet south of southeast fence corner at forks of Elgin and Lexington road with a public road leading eastward; iron post, marked "S. A. 573"...	573.026
Elgin, ½ mile northeast of; tack in stake at southwest corner of cultivated field, southeast side of road, 150 feet northwest of negro schoolhouse and 100 feet northeast of square bend in road	585.18
Missouri, Kansas and Texas Railway crossing, ½ mile north of Elgin station, top of rail.....	595.0

NORTHWARD ALONG MISSOURI, KANSAS AND TEXAS RAILWAY TO COUPLAND

Milepost 934, spike in back of second telegraph pole north of	597.59
Milepost 934, first public road crossing north of; top of rail.....	599.8
Trestle No. 2002, top of rail	595.7
Milepost 933, spike in back of telegraph pole	610.82
Trestle No. 2001, top of rail	597.4
Trestle No. 2000, top of rail	591.9
Trestle No. 1999, top of rail	579.4
Milepost 932, spike in third telegraph pole north of.....	576.60
Trestle No. 1998, top of rail	575.4
Milepost 932, first public road crossing north of; top of rail.....	585.2
Trestle No. 1997, top of rail	577.7
Milepost 931, spike in front of telegraph pole.....	582.06
Trestle No. 1995, top of rail	580.3
Travis and Bastrop county line, public road crossing at; top of rail	594.2
Trestle No. 1994, top of rail	591.6
Milepost 930, spike in back of first telegraph pole north of.....	593.06
Trestle No. 1993, top of rail	606.3
Milepost 929, spike in front of first telegraph pole north of.....	598.33
Trestle No. 1992, top of rail	579.8
Trestle No. 1991, top of rail	569.7
Trestle No. 1990, top of rail	555.5
Milepost 928, spike in back of telegraph pole.....	551.79
Trestle No. 1989, top of rail	545.6
Trestle No. 1988, top of rail	531.3
Trestle No. 1987, top of rail	531.4
Coupland, top of rail in front of station.....	529.7
Coupland, opposite station, 50 feet east of main track of Missouri, Kansas and Texas Railway, and 5 feet east of southwest corner of fence inclosing section-house yard; iron post, marked "526"	525.027

WESTWARD ALONG ELGIN, COUPLAND, AND TAYLOR PUBLIC ROAD, FROM COUPLAND TO RICES CROSSING AND BYERSVILLE PUBLIC ROAD.

Brushy Creek bridge, floor of.....	517.7
Brushy Creek, bed of.....	496.0

WESTWARD ALONG RICES CROSSING AND BYERSVILLE PUBLIC ROAD FROM ELGIN, COUPLAND, AND TAYLOR PUBLIC ROAD TO RICES CROSSING.

Coupland, 2 miles west of; spike in root on west side of 12-inch leaning hackberry tree on north side of road, 25 feet west of small bridge across ravine	510.64
Coupland, 3 miles west of; spike in root on north side of 12-inch pin-oak tree, south side of road, 3 feet from fence ½ mile west of forks of roads.	537.50

	Feet.
Rices Crossing, 1 mile east of; spike in root on north side of 8-inch elm tree on south fence line of road, 300 feet west of small farmhouse.....	529.77
Rices Crossing, southeast corner of intersection of Rices Crossing and Byersville road with Taylor and Manor public road, 150 feet southwest of schoolhouse; iron post, marked "S. A. 556".....	555.027
SOUTHWARD ALONG TAYLOR AND MANOR PUBLIC ROAD FROM RICES CROSSING.	
Rices Crossing, 1 mile south of; spike in root of 21-inch hackberry tree, 25 feet west of road, 250 feet north of point where road crosses Brushy Creek	532.27
Brushy Creek, bed of.....	517.5
Rices Crossing, 2 miles south of; spike in southwest side of cedar-fence cornerpost at point where road makes square turn from north to west, 35 feet northwest of gate to a pasture	559.67
Rices Crossing, 3½ miles south of; spike in charred cedar-fence cornerpost, west side of road, on division line between two cultivated fields, 50 feet north of gate	554.68
Cottonwood Creek, west fork, floor of bridge.....	528.6
Cottonwood Creek, west fork, bed of.....	525.0
Rices Crossing, 4 miles south of; 4 feet north of northeast fence cornerpost at forks of Taylor and Manor road with a public road leading eastward; iron post, marked "S. A. 528"	527.138
EASTWARD ALONG A PUBLIC ROAD FROM TAYLOR AND MANOR ROAD TO TAYLOR AND WEBBERVILLE PUBLIC ROAD.	
Manda post-office, 2 miles northwest of; spike in cedar fencepost 15 feet east of gate, at point where road makes square turn from north to east.	542.80
Cottonwood Creek, east fork, floor of bridge	515.6
Cottonwood Creek, east fork, bed of.....	511.0
Summit of hill, divide between Cottonwood and Willow creeks.....	570.0
Manda post-office, 1 mile north of; spike in fencepost at southwest corner of crossroads	565.05
SOUTHEASTERLY ALONG TAYLOR AND WEBBERVILLE PUBLIC ROAD.	
Manda post-office, 100 feet southwest of; on west side of road at intersection with road to Elgin, 25 feet south of fence corner, 100 feet southwest of Lutheran church; iron post, marked "S. A. 558"	556.975
Manda post-office, 1 mile south of; spike in southeast fence cornerpost at point where road makes a square turn from north to east, ¼ mile west of Swedish Free Chapel.....	503.70
Manda post-office, 2 miles southeast of; spike in cedar fencepost east side of road, 8 feet south of gate at north end of private lane running parallel to public road	522.49
Manda post-office, 3 miles southeast of; spike in fence cornerpost east side of road, at point where road begins a "goose neck" curve around ravine.	513.59
Littig, 4½ miles northwest of; spike in northeast fence cornerpost at point where road makes a square turn from north to east, west road leading to Manor	472.14
Littig, 2½ miles northwest of; wire nail in south gatepost on east side of road, from which a lane leads to a yellow painted farmhouse about 600 feet east, 200 feet southeast of a negro schoolhouse.....	480.82
EASTWARD ALONG MANOR AND M'GUINNESS SETTLEMENT ROAD.	
Littig, 1½ miles west of; spike in west gatepost on north side of private road running from Taylor and Webberville road to Manor and McGuinness settlement road.....	466.56

TRIANGULATION AND SPIRIT LEVELING.

437

	Feet.
Willow Creek bridge, floor of.....	437.6
Willow Creek, bed of.....	426.0

NORTHEASTERLY ALONG HOUSTON AND TEXAS CENTRAL RAILROAD FROM LITTIG.

Littig station, top of rail in front of.....	464.4
Littig, 800 feet east of station, 40 feet south of Houston and Texas Central Railroad track, 4 feet north of right-of-way fence cornerpost; iron post, marked "S. A. 470".....	470.154
Littig, first road crossing east of; top of rail.....	481.7
Trestle No. 215 top of rail.....	487.6
Milepost 92, spike in front of third telegraph pole east of.....	487.09
Milepost 92, first public road crossing northeast of; top of rail.....	500.0
Milepost 91, spike in front of second telegraph pole southwest of.....	491.04
Milepost 91, public road crossing $\frac{1}{2}$ mile northeast of; top of rail.....	501.2
Milepost 91, 1 mile northeast of; spike in front of telegraph pole opposite water tank.....	505.17
Trestle No 206, top of rail.....	536.4
Milepost 89, 528 feet southwest of; top of rail at public road crossing....	550.7
Milepost 89, spike in front of third telegraph pole southwest of.....	549.37
Trestle No. 204, top of rail.....	557.4
Trestle No. 203, top of rail.....	571.4
Elgin freight depot, top of rail, in front of.....	579.4

M'DADE, NORTHERLY TO BEAUKISS, ALONG TAYLOR AND M'DADE ROAD.

McDade, $1\frac{1}{2}$ miles north of; top of hill.....	562.0
McDade, 2 miles north of; spike in base west side of 24-inch post-oak tree in middle of road, opposite road leading off to west.....	538.40
McDade, 5 miles north of; spike in base on east side of 9-inch blackjack tree on west side of road, 5 feet east of west fence line, 150 feet north of farmhouse.....	509.31
Mine Creek, bed of.....	478.0
McDade, 6 miles north of; spike in base on west side of 8-inch pin-oak tree on east side of road, 350 feet south of forks with road leading to Giddings.....	469.53
Willow Creek bridge, floor of.....	453.8
Willow Creek, bed of.....	448.0
Beaukiss, 5 miles south of; spike in root on west side of 13-inch post-oak tree in middle of road, 80 feet north of point where private road leads eastward.....	490.12
Beaukiss, 3 miles south of; spike in base on west side of 24-inch post-oak tree, east side of road, 100 feet north of forks of road on left bank of Spring Branch.....	445.76
Beaukiss, $1\frac{1}{2}$ miles south of; floor of bridge across Second Yegua Creek...	457.3
Second Yegua Creek, bed of.....	443.0

SOUTHERLY ALONG TAYLOR AND GIDDINGS ROAD FROM ITS EASTERN INTERSECTION WITH ELGIN AND LEXINGTON ROAD.

Blue post-office, 3 miles northwest of; spike in root on north side of 18-inch post-oak tree on south side of road, 500 feet east of point where road makes a square bend from north to east.....	445.48
Second Yegua Creek bridge, floor of.....	408.5
Second Yegua Creek, bed of.....	394.0
Blue post-office, 600 feet east of; spike in base of east side of 16-inch post-oak tree used as guidepost at northeast corner of crossing of Taylor and Giddings and Austin and Lexington roads.....	474.52

AUSTIN QUADRANGLE.

AUSTIN TO M'NEAL, ALONG INTERNATIONAL AND GREAT NORTHERN RAILROAD.

	Feet.
Milepost 179, spike in back of first telegraph pole south of.....	480.36
Trestle No. 382, first road crossing north of; top of rail.....	510.3
Milepost 178, first public road crossing south of; top of rail.....	532.8
Milepost 178, spike in front of second telegraph pole north of.....	537.14
Trestle No. 378½, public road crossing, at top of rail.....	568.3
Milepost 177, spike in front of telegraph pole at	588.93
Milepost 176, spike in back of telegraph pole at	641.80
Austin, 5 miles north of; south side of Bull Creek road, 750 feet north of signboard at Hooper switch, 27 feet east of track; iron post, marked "SA 702"	702.129
Trestle No. 375, top of rail	705.4
Milepost 174, spike in front of second telegraph pole north of.....	700.27
Trestle No. 374, top of rail	705.9
Milepost 173, spike in front of first telegraph pole south of.....	716.92
Trestle No. 371, top of rail	720.3
Milepost 173, public road crossing ¼ mile north of; top of rail	722.1
Trestle No. 370, top of rail	722.3
Milepost 172, spike in front of first telegraph pole north of	746.36
Milepost 172, first road crossing north of; top of rail	748.7
Trestle No. 369, top of rail	746.4
Duval, 2½ miles south of; south side of Fiskville public road, 250 feet south of Amboy station, 22 feet west of track; iron post, marked "SA 758"	758.077
Amboy station, top of rail in front of.....	758.7
Trestle No. 368, top of rail	760.8
Milepost 170, spike in back of telegraph pole at	792.42
Milepost 170, public road crossing ¼ mile north of; top of rail.....	800.7
Trestle No. 364, top of rail	788.1
Duval, top of flat limestone rock 15 inches in diameter, 100 feet north of switch-head block, 42 feet west of track, 6 feet south of telegraph pole; bronze tablet, marked "SA 797"	797.273
Trestle No. 362, top of rail	799.4
Milepost 168, spike in back of telegraph pole at	831.67
Milepost 167, spike in back of second telegraph pole north of.....	795.90
McNeil, intersection of International and Great Northern Railroad with the Austin and Northwestern Railroad at.....	836.5
McNeil, 75 feet north of intersection of International and Great Northern and Austin and Northwestern railroads, 22 feet northeast of Austin and Northwestern Railroad track; top of and near acute point of triangular limestone rock; bronze tablet, marked "SA 836"	836.501

M'NEIL TO LLANO, ALONG NORTHWESTERN RAILROAD.

Milepost 17, spike in first telegraph pole north of.....	813.24
Trestle No. 17 A, top of rail	804.8
Milepost 18, spike in first telegraph pole southeast of.....	822.94
Trestle No. 18 A, top of rail	815.7
Milepost 19, spike in first telegraph pole west of.....	820.15
Trestle No. 19 A, top of rail	841.5
McNeil, 3½ miles northwest of; west side of public road 22 feet south of track, 500 feet east of section house; iron post, marked "SA 857"	857.201

GEORGETOWN QUADRANGLE.

Milepost 20, first public road crossing northwest of; top of rail	892.7
Trestle No. 20 A, top of rail	888.7

	Feet.
Milepost 21, spike in front of first telegraph pole east of	906.61
Milepost 21, public road crossing $\frac{1}{4}$ mile west of; top of rail	930.1
Milepost 22, spike in front of	918.49
Trestle No. 22 B, top of rail	880.3
Milepost 23, spike in front of first telegraph pole southeast of	804.87
Brushy Creek, trestle over top of rail	841.4
Milepost 24, spike in back of first telegraph pole east of	854.60
Trestle No. 24 B, top of rail	869.1
Cedar Park, $\frac{1}{4}$ mile east of; west side of Round Rock and Buttercup public road crossing, 26 feet north of track; iron post, marked "SA 893"	893.281
Trestle No. 25 B, top of rail	897.1
Cedar Park and Georgetown public road crossing, top of rail	815.9
Cedar Park post-office, top of rail in front of	919.2
Milepost 26, spike in back of second telegraph pole northwest of	923.69
Trestle No. 26 A, top of rail	924.5
Cedar Park, $1\frac{1}{4}$ miles northwest of; northwest side of Georgetown and Travis county-line public road, 46 feet southwest of track at right-of-way-fence corner; iron post, marked "SA 968"	968.224
Trestle No. 27 A, top of rail	967.0
Milepost 28, public road crossing 100 feet east of; top of rail	999.7
Milepost 28, spike in front of first telegraph pole east of	1,001.53
Trestle No. 28 A, top of rail	975.5
Milepost 29, spike in front of first telegraph pole northwest of	972.93
Leander, $1\frac{1}{4}$ miles southeast of; southeast side of public road crossing, 45 feet southwest of track; iron post, marked "SA 993"	993.092
Trestle No. 29 B, top of rail	993.1
Milepost 30, public road crossing $\frac{1}{4}$ mile northwest of; top of rail	1,004.6
Trestle No. 30 A, top of rail	976.0
Leander, 650 feet south of station at; on south side of public road, 46 feet west of track; iron post, marked "SA 983"	983.078
Leander station, top of rail in front of	980.4
Trestle No. 31 A, top of rail	972.3
Milepost 32, spike in front of first telegraph pole south of	966.74
Trestle No. 32 B, top of rail	969.3
Milepost 33, 375 feet south of; spike in north side of 6 by 8 inch fencepost, 6.5 feet east of track, south side of public road	1,000.51
Public road crossing, top of rail	1,000.3
Trestle No. 33 C, top of rail	963.3
Milepost 34, spike in front of	946.26
Trestle No. 34 A, top of rail	934.2
Trestle No. 35 A, top of rail at north end	912.1
Gabriel River, 600 feet north of; spike in back of 6 by 8 inch pine fencepost, 7 feet east of track at cattle guard	914.12
Gabriel River, $\frac{1}{4}$ mile north of; settlement road crossing, top of rail	945.1
Liberty Hill, 3 miles southeast of; north side of settlement road, 27 feet east of track; iron post, marked "SA 968"	968.064
Milepost 37, spike in back of first telegraph pole southeast of	981.55
Trestle No. 37 A, top of rail	988.3
Milepost 38, spike in front of	1,001.97
Trestle No. 38 A, top of rail	1,005.8
Liberty Hill station, top of rail in front of	1,038.1
Liberty Hill station, 80 feet northwest of northwest corner of; 50 feet north-east of main track on northwest side of Liberty Hill and Round Rock public road; iron post, marked "SA 1040"	1,040.198
Trestle No. 39 A, top of rail	1,046.2

	Feet.
Milepost 40, spike in front of first telegraph pole east of	1, 072. 12
Milepost 40, 500 feet west of; public road crossing, top of rail	1, 063. 1
Trestle No. 40 A, top of rail	1, 055. 1
Liberty Hill, 2½ miles northwest of; on south side of settlement road, 28 feet east of track; iron post, marked "SA 1098"	1, 098. 156

BURNET QUADRANGLE.

Milepost 42, spike in front of first telegraph pole north of	1, 120. 90
Milepost 43, spike in front of first telegraph pole northwest of	1, 137. 98
Milepost 44, spike in front of first telegraph pole northwest of	1, 148. 20
Milepost 45, spike in back of third telegraph pole northwest of	1, 166. 47
Milepost 46, spike in back of first telegraph pole southeast of	1, 173. 47
Bertram, 1½ miles southeast of; on southeast side of a settlement road, 43 feet southwest of track; iron post, marked "SA 1198"	1, 198. 134
Milepost 48, spike in back of third telegraph pole southeast of	1, 210. 80
Bertram, 120 feet southeast of station; 24 feet southwest of track on northwest side of Bertram and Brooks Mill public road; iron post, marked "SA 1266"	1, 266. 472
Bertram, in front of station; top of rail	1, 267. 6
Milepost 50, spike in back of first telegraph pole east of	1, 285. 40
Trestle No. 50 A, top of rail	1, 301. 0
Milepost 51, spike in back of second telegraph pole east of	1, 307. 07
Milepost 52, ¼ mile southeast of; road crossing, top of rail	1, 343. 5
Milepost 52, spike in back of third telegraph pole northwest of	1, 344. 67
Trestle No. 52 A, top of rail	1, 337. 5
Milepost 53, spike in front of first telegraph pole northwest of	1, 343. 28
Milepost 54, spike in front of first telegraph pole west of	1, 399. 13
Milepost 55, spike in back of first telegraph pole east of	1, 419. 14
Milepost 56, spike in back of first telegraph pole northwest of	1, 474. 09
Burnet, 3¼ miles east of; 500 feet west of head block of switch at summit, 57 feet southwest of milepost 57, 19 feet south of main track, top of limestone outcrop; iron post, marked "SA 1494"	1, 494. 341
Trestle No. 58 A, top of rail	1, 400. 0
Burnet, 2 miles east of; 47 feet west of track, 17 feet south of gate at a private road crossing; iron post, marked "SA 1387"	1, 387. 083
Milepost 59; spike in back of second telegraph pole west of	1, 339. 00
Trestle No. 59 A, top of rail	1, 299. 1
Burnet, ½ mile south of station; on southeast side of Pecan street, 30 feet southwest of track; iron post, marked "SA 1282"	1, 282. 185
Trestle No. 60 A, top of rail	1, 287. 8
Burnet, top of rail in front of station	1, 293. 9
Burnet, east front of county court-house, in north end of first window sill south of entrance; bronze tablet, marked "SA 1300"	1, 299. 785
Trestle No. 60 B, top of rail	1, 277. 8
Milepost 61, spike in front of telegraph pole opposite to	1, 263. 87
Trestle No. 61 A, top of rail	1, 252. 2
Milepost 62, spike in front of first telegraph pole northeast of	1, 256. 14
Burnet, 2 miles southwest of; on northwest side of Burnet and Marble Falls public road, 36 feet northeast of track; iron post, marked "SA 1250"	1, 250. 04
Trestle No. 62 A, top of rail	1, 239. 2
Milepost 63, spike in front of second telegraph pole northeast of	1, 230. 43
Trestle No. 63 A, top of rail	1, 232. 8
Milepost 64, spike in front of first telegraph pole south of	1, 188. 07

	Feet.
Trestle No. 64 A, top of rail.....	1,185.6
Milepost 65, spike in front of telegraph pole opposite to.....	1,175.550
Trestle No. 65 A, top of rail.....	1,127.0
Milepost 66, spike in front of telegraph pole opposite to.....	1,124.22
Trestle No. 66 A, top of rail.....	1,112.0
Fairland, 3 miles northeast of; on south side of a private road crossing $\frac{1}{2}$ mile north of Sudduth section house, 27 feet west of track; iron post, marked "SA 1142".....	1,142.072
Sudduth section house, top of rail in front of.....	1,143.4
Milepost 68, spike in back of second telegraph pole southwest of.....	1,139.37
Trestle No. 68 C, top of rail.....	1,119.8
Milepost 69, spike in back of telegraph pole opposite to.....	1,068.80
Trestle No. 69 A, top of rail.....	1,060.1
Milepost 70, 100 feet southwest of public road crossing, top of rail.....	922.5
Trestle No. 70 A, top of rail.....	976.8
Fairland station, east side of; top of rail.....	972.5
Fairland, 70 feet southwest of Marble Falls branch track, on southeast side of Burnet and Fredericksburg public road; iron post, marked "SA 953".....	953.269
Milepost 71, spike in front of first telegraph pole east of.....	963.45
Trestle No. 71 A, top of rail.....	964.1
Milepost 72, $\frac{1}{2}$ mile east of; Burnet and Fredericksburg road crossing, top of rail.....	967.2
Trestle No. 71 C, top of rail.....	966.4
Milepost 72, spike in back of first telegraph pole west of.....	960.04
Trestle No. 72 A, top of rail.....	966.6
Fairland, 3 miles southwest of; on southeast side of Burnet and Fredericksburg public road crossing, near right of way fence corner, 44 feet south of track; iron post, marked "SA 992".....	992.04
Trestle No. 73 D, top of rail.....	989.2
Milepost 74, spike in back of third telegraph pole west of.....	984.69
Trestle No. 74 C, top of rail.....	963.2
Milepost 75, spike in front of second telegraph pole west of.....	958.29
Trestle No. 75 A, top of rail.....	930.9
Milepost 76, spike in front of first telegraph pole west of.....	915.06
Trestle No. 76 B, top of rail.....	903.1
Kingsland, 3 miles southeast of; on north side of a public road, 52 feet south of track and 110 feet west of trestle No. 76 C; iron post, marked "SA 881".....	881.329
Trestle No. 77 B, top of rail.....	852.0
Milepost 78, spike in front of first telegraph pole northwest of.....	840.62
Trestle No. 78 B, top of rail.....	847.3
Milepost 79, spike in back of first telegraph pole southeast of.....	847.37
Bridge No. 79 A, over Colorado River, top of rail.....	851.4
Kingsland, top of rail in front of station.....	856.3
Kingsland, near southwest corner of small park opposite station, 21 feet north of main track; iron post, marked "SA 856".....	856.298
Trestle No. 79 B, top of rail.....	850.7
Milepost 81, $\frac{1}{2}$ mile southeast of; top of rail at road crossing.....	879.2
Trestle No. 80 C, top of rail.....	884.5
Milepost 81, spike in front of first telegraph pole south of.....	893.4
Trestle No. 81 B, top of rail.....	896.8
Milepost 82, spike in front of first telegraph pole south of.....	929.15
Trestle No. 82 A, top of rail.....	935.8

	Feet.
Kingsland, 3 miles northwest of; at forks of old Fort Mason and Kingsland and Llano public roads, 70 feet west of track, 23 feet north of twin elm tree utilized as a milepost "Kingsland 3 $\frac{1}{4}$ miles"; iron post, marked "SA 954".....	953.452
Trestle No. 83 C, top of rail.....	927.8
Milepost 84, spike in back of first telegraph pole southeast of.....	926.24
Trestle No. 84 A, top of rail.....	921.4
Bridge No. 84 B, top of rail.....	913.7
Trestle No. 85 A, top of rail.....	914.1
Kingsland, 5 $\frac{1}{4}$ miles northwest of, on west side of settlement road, $\frac{1}{2}$ mile southeast of bridge No. 85 B, over Sandy Creek, 27 feet southwest of track; iron post, marked "SA 914".....	913.536
Bridge No. 85 B, over Sandy Creek, top of rail.....	913.8
Trestle No. 85 C, top of rail.....	922.7

LLANO QUADRANGLE.

Milepost 86, spike in front of first telegraph pole northwest of.....	931.07
Trestle No. 86 A, top of rail.....	937.4
Bridge No. 86 B, top of rail.....	937.6
Milepost 87, spike in back of second telegraph pole southeast of.....	953.71
Trestle No. 87 A, top of rail.....	961.9
Graphite station, top of rail in front of.....	986.6
Milepost 88, spike in front of telegraph pole opposite to.....	997.28
Trestle No. 88 A, top of rail.....	1,004.0
Llano, 10 $\frac{1}{4}$ miles southeast of, on north side of Lone Grove public road, 1 $\frac{1}{2}$ miles northwest of Graphite station, 19 feet east of track; iron post, marked "SA 1015".....	1,014.475
Trestle No. 89 A, top of rail.....	994.0
Bridge No. 89 C.....	959.5
Milepost 90, spike in front of first telegraph pole northwest of.....	959.87
Milepost 91, spike in back of second telegraph pole northwest of.....	956.3
Llano, 8 miles southeast of, on northwest side of a private road, 500 feet southeast of trestle No. 91 A, 22 feet southwest of track; iron post, marked "SA 967".....	966.651
Bridge No. 91 B, top of rail.....	970.2
Milepost 93, spike in front of fourth telegraph pole southwest of.....	968.51
Bridge No. 93 B, top of rail.....	974.3
Llano, 5 $\frac{1}{2}$ miles northeast of; 5 feet northeast of gate at entrance to Bessemer station grounds, 150 feet north of track; iron post, marked "SA 988".....	987.621
Trestle No. 93 C, top of rail.....	981.1
Trestle No. 94 B, top of rail.....	981.0
Bridge No. 94 E, top of rail.....	981.3
Milepost 95, spike in back of second telegraph pole northeast of.....	981.97
Trestle No. 95 D, top of rail.....	994.5
Milepost 96, spike in back of fifth telegraph pole southwest of.....	985.37
Trestle No. 96 B, top of rail.....	1,006.2
Llano, 2 $\frac{1}{2}$ miles southeast of; 9 feet east of private road gate, 45 feet north of track; iron post, marked "SA 1027".....	1,026.503
Trestle No. 97 B, top of rail.....	1,025.6
Milepost 98, spike in front of.....	1,013.35
Trestle No. 98 C, top of rail.....	1,017.4
Llano, passenger station, top of rail in front of.....	1,028.9
Llano, in front of small park at east end of freight depot, 32 feet south of main track; iron post, marked "SA 1029".....	1,028.743

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Llano, Ford street, floor of bridge over Llano River	1, 020. 3
Llano, county court-house, south side of entrance on east front of; chiseled cross on balustrade in front of pillar	1, 049. 38
Llano, county court-house, south side of entrance on east front of; in face of pedestal to pillar; bronze tablet, marked "SA 1050"	1, 049. 632

LLANO TO FREDERICKSBURG, ALONG LLANO AND FREDERICKSBURG PUBLIC ROAD.

Llano, 1 mile south of; 100 feet north of farmhouse; spike in root of west side of 16-inch live-oak tree (utilized as fencepost) on east side of road.	1, 080. 71
Llano, 2½ miles south of; on west side of road 125 feet south of Oatman Creek, 45 feet south of northeast corner of a cultivated field; iron post, marked "SA 1075"	1, 074. 715
Llano, 3¼ miles south of; bed of Oatman Creek	1, 080. 0
Llano, 4 miles south of; spike in base of west side of 24-inch post-oak tree (utilized as fencepost) east side of road, about 500 feet southeast of schoolhouse	1, 117. 53
Llano, 6 miles south of; 41 feet west of east fence line of road, 22 feet west of wagon tracks in clump of scrub live oaks on summit of hill; iron post, marked "SA 1244"	1, 243. 864
Oxford, 1½ miles north of; 90 feet north of 26 inch dead post-oak tree on west side of road near summit of hill; iron post, marked "SA 1430" ...	1, 429. 89
Oxford, 15 feet south of post-office on west side of road; iron post, marked "SA 1333"	1, 332. 765
Oxford, 2½ miles south of; 14 feet south of gate on east side of road, at junction with settlement road running east to Click; iron post, marked "SA 1221"	1, 220. 873
Sandy Creek, bed of	1, 142. 0
Oxford, 4½ miles south of; 5 feet south of 13-inch post-oak tree utilized as a gatepost, on west side of road, at junction with road running west to the Enchanted Rock; iron post, marked "SA 1261"	1, 260. 869

FREDERICKSBURG QUADRANGLE.

Oxford, 9 miles south of; east side of road, at junction with road running east, 10 feet north of 18-inch post-oak tree utilized as a gatepost; iron post, marked "SA 1287"	1, 287. 787
Oxford, 12½ miles south of; east side of road on west slope of Bell Mountain at summit of hill; iron post, marked "SA 1851"	1, 850. 851
Oxford, 13½ miles south of; on west side of road, about 100 feet north of farmhouse on east side of road; spike in root east side of 12-inch elm tree	1, 854. 36
Fredericksburg, 14½ miles northeast of; 12 feet west of southwest fence corner, at junction with Willow City and Llano road; iron post, marked "SA 1749"	1, 749. 877
Willow Creek, bed of	1, 700. 0
Fredericksburg, 12½ miles northeast of; 8 feet north of northwest fence corner, at junction with Burnet and Fredericksburg public road; iron post, marked "SA 1826"	1, 826. 774
Fredericksburg, 9½ miles northeast of; on northwest side of road by wire fence, 27 feet northwest of 14-inch post-oak tree at fence angle; iron post, marked "SA 1853"	1, 953. 842
Summit of hill	1, 980. 0
Fredericksburg, 6½ miles northeast of; on west side of road, 60 feet east of gate at Grobe's farm, 4 feet west of 15-inch post-oak tree utilized as fence-corner post; iron post, marked "SA 1724"	1, 724. 819

	Feet.
Fredericksburg, $4\frac{1}{2}$ miles northeast of; 18 feet north of fence corner at angle in road, 650 feet northeast of Palo Alto Creek; iron post, marked "SA 1649"	1, 649. 799
Palo Alto Creek, bed of	1, 628. 0
Fredericksburg, $2\frac{1}{2}$ miles northeast of; at forks with a settlement road running northward, 8 feet northeast of northeast fence corner; iron post, marked "SA 1824"	1, 824. 817
Fredericksburg, $\frac{3}{4}$ mile northeast of; 40 feet northeast of fence corner at lane running northeasterly, spike in cedar fencepost	1, 709. 98
Fredericksburg, county court-house, southeast front of; in stone trimming at corner of projection, 7 feet northeast of entrance; bronze tablet, marked "SA 1708"	1, 708. 864
Fredericksburg, northwest side of Fredericksburg and Comfort public road, 55 feet southwest of Main street; iron post, marked "SA 1695" ...	1, 695. 942

FREDERICKSBURG TO COMFORT, ALONG FREDERICKSBURG AND COMFORT ROAD.

Barron's Creek, bed of	1, 655. 0
Fredericksburg, $1\frac{1}{2}$ miles south of; southeast corner of intersection with settlement road, spike in fence corner post	1, 715. 73
Fredericksburg, 2 miles south of; 10 feet west of east fence line at right-angle bend in road from west to south, spike in root west side 6-inch post-oak tree	1, 707. 84
Fredericksburg, $4\frac{1}{2}$ miles south of; on north side of road 4 feet west of fence post at slight angle, on north bank of Pedernales River; iron post, marked "SA 1609"	1, 609. 920
Pedernales River, bed of	1, 572. 0
Fredericksburg, $6\frac{1}{2}$ miles south of; on summit of hill, 15 feet south of twin scrub pin oak tree, 3 feet east of west fence line of road; iron post, marked "SA 1779"	1, 779. 986
Fredericksburg, 9 miles south of; 2 feet northeast of fence-corner post on west side of road, 105 feet south of 9-mile post; iron post, marked "SA 1865"	1, 865. 841
Fredericksburg, 11 miles south of; on east side of road and south bank of Bear Creek, spike in root west side 12-inch scrub live-oak tree, utilized as a gatepost	1, 841. 22
Fredericksburg, $12\frac{1}{2}$ miles south of; west side of road opposite to a stone farmhouse, spike in root east side 16-inch live-oak tree utilized as a gatepost	1, 918. 84
Comfort, $11\frac{1}{2}$ miles north of; 7 feet east of 22-inch dead post-oak tree utilized as a fence-corner post at right-angle bend in road from east to south; iron post, marked "SA 1976"	1, 976. 747
Comfort, $9\frac{1}{2}$ miles north of; on west side of road 7 feet north of gate; iron post, marked "SA 2094"	2, 094. 955
Comfort, $6\frac{1}{2}$ miles north of; 18 feet north of gate opening into a cultivated field on west side of road by a stone wall; iron post, marked "SA 1714" ..	1, 715. 052
North Creek, bed of	1, 597. 0
Comfort, $4\frac{1}{2}$ miles north of; east side of road on bank of North Creek, spike in base south side of 11-inch sycamore tree	1, 551. 75
Comfort, $3\frac{1}{2}$ miles north of; 10 feet north of farm gate, 600 feet west of a stone farmhouse on west side of road; iron post, marked "SA 1530" ...	1, 531. 056
Comfort, $1\frac{1}{2}$ miles north of; north of guidepost "To Cypress Creek" at northwest corner of junction with road running northwesterly; iron post, marked "SA 1521"	1, 522. 11
Comfort, San Antonio and Aransas Pass Railway station, at iron post opposite to	1, 436. 630

TRIANGULATION AND SPIRIT LEVELING.

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See Cares to Willow City, along public roads, via Round Mountain.

AUSTIN QUADRANGLE.

WESTWARD ALONG BEE CAVES AND ROUND MOUNTAIN PUBLIC ROAD.

	Feet.
Little Barton Creek, bed of.....	996.0
Bee Caves, 3½ miles west of; 13 feet west of fence-corner post south side of road at bend in road from northeast to west; iron post, marked "SA 1193"	1, 192.918
Bee Caves, 6½ miles west of; east side of road 10 feet north of twin elm trees at corner of stone wall; iron post, marked "SA 1120"	1, 119.966
Junction with Austin and Round Mountain road.....	1, 355.0

BLANCO QUADRANGLE.

NORTHWESTERLY ALONG AUSTIN AND ROUND MOUNTAIN PUBLIC ROAD TO ROUND MOUNTAIN.

Shingle Hill, summit of road at	1, 373.0
Bee Caves, 9 miles northwest of; at forks with a settlement road running southward; iron post, marked "SA 1321"	1, 320.782
Bee Caves, 10 miles northwest of; between old and new wagon tracks, nail in root west side live-oak stump	1, 176.84
Cypress Mill, 10½ miles southeast of; in top of 24 by 48 inch limestone outcrop on northeast side of road; bronze tablet, marked "SA 921"	921.261
Hamilton Branch, bed of	842.0
Pedernales River, bed of	695.0
Cypress Mill, 8 miles southeast of; in top of limestone outcrop, west bank of Pedernales River, north side of road, 21 feet south of picket-fence corner; tablet, marked "SA 815"	815.076
Cypress Mill, 5½ miles southeast of; 3 feet north of cedar post at angle in fence on north side of road, 300 feet west of a farmhouse; iron post, marked "SA 928"	927.953
Cypress Mill, 2½ miles southeast of; at forks with settlement road running southwest; iron post, marked "SA 964"	964.008
Cypress Mill, in top of limestone rock 4 feet in diameter, west side of road, 250 feet northeast of post-office, 100 feet south of Cypress Creek; bronze tablet, marked "SA 976"	975.569
Cypress Creek, bed of	970.0
Cypress Mill, 3 miles northwest of; 2 feet east of telephone on summit of hill, north side of road; iron post, marked "SA 1172"	1, 171.837
Round Mountain, 2½ miles southeast of; 300 feet southeast of bridge over a dry branch, spike on northeast side of telephone pole southwest side of road	1, 166.44
Round Mountain, 1½ miles southeast of; in front of vacant one-story stone house on northeast side of road, spike in southwest side of telephone pole	1, 177.57
Round Mountain, ½ mile east of post-office at; 4 feet west of fence corner, 200 feet northwest of Baptist church at forks of roads; iron post, marked "SA 1292"	1, 291.997
Cypress Creek, northeast fork, bed of	1, 241.0
Round Mountain, at junction of Round Mountain and Llano and Round Mountain and Fredericksburg public roads, spike in west side of telephone pole.....	1, 255.40

NORTHWESTERLY ALONG ROUND MOUNTAIN AND LLANO PUBLIC ROAD TO SMITH'S RANCH.

Round Mountain, 2½ miles northwest of; 4 feet west of gate to a pasture on south side of road; iron post, marked "SA 1413"	1, 412.991
Hill, summit of.....	1, 496.0

	Feet.
Pecan Creek, bed of	1, 330. 0
Round Mountain, 5 miles northwest of; northwest side of road, 18 feet southeast of telephone pole at slight bend in road; iron post, marked "SA 1374"	1, 373. 777
Round Mountain, 8½ miles northwest of; at Smith's ranch, 5 feet southeast of gate southwest side of road at intersection with Fredericksburg and Marble Falls road; iron post, marked "SA 1171"	1, 170. 911

SOUTHWESTERLY ALONG FREDRICKSBURG AND MARBLE FALLS PUBLIC ROAD FROM SMITH'S RANCH.

Smith's ranch, 2 miles west of; north side of road on east edge of a small dry creek, spike in base north side 20-inch post-oak tree	1, 101. 55
Walnut Creek, west fork, bed of	1, 083. 0
Smith's ranch, 3 miles west of; 7 feet north of gate on division fence line north side of road; iron post, marked "SA 1149"	1, 148. 967

SOUTHWESTERLY ALONG FREDERICKSBURG AND BURNET PUBLIC ROAD.

Smith's ranch, 4 miles west of; 7 feet west of east fence line, 400 feet south of gate, nail in stump of limb at base of 8-inch mesquite tree	1, 116. 70
White Creek, bed of	1, 046. 0
Blowout, 4½ miles northeast of; 7 feet southwest of gate, 800 feet southwest of White Creek on northwest side of road; iron post, marked "SA 1075"	1, 074. 699
Blowout, 2½ miles northeast of; east side of road on north bank of small creek, nail in root east side 16-inch live-oak tree	1, 199. 07
Comanche Creek, bed of	1, 230. 0
Blowout, 1½ miles northeast of; 2 feet southwest of gate, 500 feet southwest of Comanche Creek on northwest side of road; iron post, marked "SA 1240"	1, 239. 906

FREDERICKSBURG QUADRANGLE.

Blowout, 1 mile southwest of; in top of granite outcrop, 11 feet east of stone wall on west side of road, 80 feet southwest of gate; bronze tablet, marked "SA 1403"	1, 402. 555
Blowout, 2 miles southwest of; west side of road at angle in stone wall on summit of hill, nail in root east side 18-inch post-oak tree	1, 438. 95
Coal Creek, bed of	1, 337. 0
Blowout, 3¼ miles southwest of; 3 feet south of mail-box post at forks of roads; iron post, marked "SA 1544"	1, 543. 742
Willow City, 6 miles northeast of; west side of road at forks, nail in root east side 12-inch post-oak tree	1, 550. 09
Willow City, 3¼ miles northeast of; 12 feet northeast of dead post-oak tree utilized as fence-corner post north side of road; iron post, marked "SA 1630"	1, 629. 870
Willow City, 1 mile northeast of; 200 feet west of gate on north side of road, nail in root north side 12-inch post-oak tree	1, 679. 37
Willow City, 8 feet west of northeast corner of Rick's cotton gin yard on south side of road; iron post, marked "SA 1680"	1, 679. 661
Willow Creek, bed of	1, 659. 0
Junction with Willow Creek and Llano road, ground at	1, 677. 0
Willow Creek, bed of	1, 666. 0
Hill, summit of	1, 859. 0

TRIANGULATION AND SPIRIT LEVELING.

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*From point 4 miles west of Smith's ranch to 2 1-4 miles south of Oxford,
via Click.*

LLANO QUADRANGLE.

NORTHWESTERLY ALONG MASON ROAD.

	Feet.
Click, 6 miles southeast of; north side of road, 250 feet west of small branch, nail in root west side triple mesquite tree.....	1,010.87
White Creek, bed of	990.0
Click, 5 miles southeast of; north side of road, 100 feet northwest of gate, spike in south side of telephone pole.....	1,050.54
Click, 4 miles southeast of; 40 feet south of telephone pole southwest side of road on summit of hill; iron post, marked "SA 1117"	1,116.881
Sandy Creek, bed of	952.0
Click, 2 miles southeast of; south side of road by a fence corner at junction with settlement road running northeast, $\frac{1}{4}$ mile west of Sandy Creek; iron post, marked "SA 1003".....	1,002.823
Miller Creek, bed of	981.0
Hill, summit of; at gate	1,061.0
Click, 1 mile southeast of; 90 feet west of gate at summit of hill, nail in root north side 24-inch live-oak tree.....	1,061.86
Miller Creek, bed of.....	1,032.0
Click, $\frac{1}{4}$ mile east of post-office at; 75 feet north of northwest corner of schoolhouse at forks of roads; iron post, marked "SA 1051".....	1,050.782
Click post-office, surface of ground in front of.....	1,050.0
Miller Creek, bed of	1,191.0
Click, 3 miles northwest of; 500 feet northwest of Brook's farmhouse on southwest side of road, nail in root west side 20-inch post-oak tree utilized as a gatepost	1,275.44
Click Gap, southeast side of road, in top of gray sandstone ledge, 13 feet north of twin live-oak tree, 40 feet southwest of summit; bronze tablet, marked "SA 1393".....	1,392.813
Click Gap, 2 $\frac{1}{4}$ miles southwest of; at forks with settlement road running east through Sandy Gap, 500 feet southwest of Moore's farmhouse; iron post, marked "SA 1099"	1,098.680

NORTHWESTERLY ALONG SETTLEMENT ROAD.

Silver Creek, bed of.....	1,102.0
Oxford, 5 miles southeast of; 150 feet west of gate, nail in crotch of twin blackjack tree on north side of road.....	1,142.32
Oxford, 4 miles southeast of; $\frac{1}{4}$ mile east of Hondo Creek, south side of road, 12 feet north of 48-inch live-oak tree, 35 feet southeast of 45-inch post-oak tree, on summit of hill; iron post, marked "SA 1194"	1,193.696
Hondo Creek, bed of	1,152.0
Lost Hollow Creek, bed of	1,196.0

From Click to point 2 miles south of Llano, along Round Mountain and Llano upper road.

Click, 2 miles north of; nail in root east side 14-inch post-oak tree bearing mile board, "Llano 16 miles," west side of road.....	1,196.66
Click, 3 miles north of; 4 feet north of east gate post at forks of roads; iron post, marked "SA 1184".....	1,184.094
Click, 6 $\frac{1}{2}$ miles north of; in top of conglomerate rock, 50 feet southeast of fence angle west of wagon tracks; bronze tablet, marked "SA 1149"....	1,149.084
Honey Creek, bed of	1,172.0
Click, 7 miles north of; 100 feet west of creek, nail in root west side 16-inch elm tree on south side of road	1,210.70

	Feet.
Click, 9 miles north of; in top of limestone outcrop, south side of road, 7 feet south of stone wall corner; bronze tablet, marked "SA 1313".....	1, 312.644
Llano, 8½ miles southeast of; summit of Riley Mountain, chiseled cross on triangular limestone rock, 50 by 36 by 50 inches, 15 feet south of road, 30 feet east of 6-inch scrub live-oak tree; rock, marked thus: "U.S.G.S. B M 1568"	1, 567.62
Llano, 7½ miles southeast of; 80 feet northwest of gate, nail in root north side 24-inch post-oak tree on southwest side of road.....	1, 351.68
Llano, 7 miles southeast of; on southwest side of road by a twin mesquite tree, at junction with a settlement road running south to Middlebrook's ranch; iron post, marked "SA 1252".....	1, 251.740
Llano, 5½ miles southeast of; on east side of road near southwest base of Sharp Mountain, nail in crotch of triple mesquite tree.....	1, 210.46
Llano, 3½ miles southeast of; 12 feet north of gate on east side of wire fence; iron post, marked "SA 1095".....	1, 095.050
Oatman Creek, bed of.....	1, 042.0

From Smith's ranch to Marble Falls, along Fredericksburg and Marble Falls road.

BURNET QUADRANGLE.

Smith's ranch, 1 mile northeast of; south side of road on east bank of small creek, nail in root south side 18-inch post-oak tree.....	1, 103.88
Smith's ranch, 2 miles northeast of; 120 feet west of small creek, nail in root north side 12-inch dead post-oak tree on north side of road.....	1, 020.80
Smith's ranch, 3 miles northeast of; 200 feet southwest of Bridge's farm house, 6 feet south of gate on south side of road; iron post, marked "SA 979".....	978.865
Pecan Creek, bed of.....	907.0
Smith's ranch, 6 miles northeast of; 25 feet southwest of road, 35 feet northwest of Slick Rock Creek; iron post, marked "SA 834".....	833.921
Slick Rock Creek, bed of.....	827.0
Marble Falls, 6½ miles southwest of; 300 feet east of intersection with settlement road, nail in root north side 15-inch post-oak tree on north side of road.....	821.50
Marble Falls, 4½ miles southwest of; on north side of road by a wire fence, 5 feet south of 15-inch post-oak tree utilized as a gate post; iron post, marked "SA 827".....	826.883
Marble Falls, 3½ miles southwest of; north side of road, in front of stone farmhouse, 250 feet west of bridge over Von Hagen Hollow, nail in root south side 12-inch live-oak tree.....	832.0
Von Hagen Hollow, floor of bridge over.....	816.0
Marble Falls, 1½ miles southwest of; east side of road at north edge of woods on east bank of river, spike in base east side 18-inch pecan tree.....	718.25
Marble Falls, ½ mile southwest of; in top of limestone outcrop 7 feet southeast of road, 250 feet southwest of bridge over Colorado River, 50 feet northeast of forks of road; aluminum tablet, marked "SA 790"....	789.762
Colorado River, floor of bridge over.....	772.0
Colorado River, bed of.....	700.0
"Marble Falls Initial Monument," top of.....	788.41
Peters Creek, bridge over First street.....	762.7
Peters Creek, bed of.....	747.0
Marble Falls, at southeast corner of park, 60 feet northeast of northeast corner of Austin and Northwestern Railroad station; iron post, marked "SA 764".....	763.929

Marble Falls to Fairland, along Austin and Northwestern Railroad.

	Feet.
Marble Falls station, top of rail in front of	763.6
Trestle No. 76A, top of rail.....	768.0
Milepost 76, railroad spike in front of first telegraph pole southeast of...	773.82
Trestle No. 75A, top of rail.....	834.0
Milepost 75, first road crossing southeast of; top of rail.....	848.1
Milepost 75, spike in front of telegraph pole opposite to.....	859.56
Trestle No. 74B, top of rail.....	866.2
Granite Mountain station, top of rail in front of.....	865.8
Milepost 74, railroad spike in front of first telegraph pole north of.....	879.47
Trestle No. 73B, top of rail.....	883.0
Spareriba Creek, bed of.....	865.0
Backbone Creek, bed of.....	869.0
Fairland, 2 miles south of; 600 feet north of milepost 73, 50 feet east of track, at right-of-way fence corner on north side of a settlement road; iron post, marked "SA 897".....	897.007
Trestle No. 72B, top of rail.....	926.8
Milepost 72, railroad spike in front of.....	932.63
Trestle No. 71A, top of rail.....	947.0

From Llano, along public and settlement roads, via Cherokee and Lone Grove, to point 8 miles southeast of Llano.

NORTHWARD ALONG LLANO AND SAN SABA ROAD (LLANO QUADRANGLE).

Llano, 3 miles north of; 4 feet south of wire-fence corner on east side of road, at junction with settlement road running east; iron post, marked "SA 1112".....	1,112.031
Wright Creek, bed of.....	1,090.0
Intersection with Burnet and Mason road, ground at.....	1,140.0
Llano, 5 miles north of; 15 feet east of west-fence line, 180 feet south of right-angle bend in road from south to east, nail in base east side 14-inch post-oak tree.....	1,220.82
Babyhead, 3½ miles south of; in top of pink granite outcrop 15 feet west of east-fence line opposite to small corral; aluminum tablet, marked "SA 1253".....	1,252.810
Babyhead, 1½ miles south of; 12 feet west of fence line, 250 feet south of intersection with settlement road, nail in root west side 16-inch post-oak tree.....	1,314.89
Babyhead, ¼ mile south of; ground at summit of hill.....	1,355.0
Babyhead, 250 feet southeast of post-office; in top of sandstone outcrop, west side of road in front of small corral; aluminum tablet, marked "SA 1348".....	1,347.614
Babyhead post-office, ground in front of.....	1,346.0
Intersection with road running northeast of Wilburns Glen.....	1,372.0
Babyhead, 1½ miles north of; 15 feet east of west fence, 150 feet north of small creek, nail in root east side of 26-inch post-oak tree.....	1,372.01
Babyhead, 3 miles north of; in top of flat granite boulder on east-fence line of road, 600 feet southeast of bend; aluminum tablet, marked "SA 1440".....	1,439.760
Babyhead, 3¼ miles north of; 12 feet west of east-fence line at bend in road, nail in base west side 24-inch post-oak tree.....	1,470.33
Cherokee, 3¼ miles south of; 1,000 feet north of cotton gin, nail in root of twin live-oak tree on northeast side of road.....	1,508.37
Cherokee, 2½ miles south of; 6 feet south of fence corner at southeast corner of crossroads; iron post, marked "SA 1515".....	1,515.012

	Feet.
Cherokee, $1\frac{1}{2}$ miles south of; on east side of road at right-angle bend from south to west, spike in top of stump 12 feet west of gate.....	1,492.14
Cherokee, West Texas Normal and Business College; chiseled cross north end of door sill at main entrance	1,529.47
Cherokee, West Texas Normal and Business College, in sandstone trimming at northwest corner of west wing of building, 6 inches above water table; aluminum tablet, marked "SA 1530"	1,530.058
Cherokee House, ground at intersection of roads in front of.....	1,500.0

EASTWARD ALONG MASON AND LAMPASAS ROAD.

Cherokee, $\frac{1}{4}$ mile east of; middle of road at right-angle bend from west to north, nail in root west side 15-inch post-oak tree.....	1,474.15
Cherokee, $1\frac{1}{2}$ miles east of; 3 feet south of north fence line, 35 feet east of bend in road from north to east, nail in root east side 9-inch post-oak tree	1,505.36
Cherokee, $3\frac{1}{2}$ miles east of; on west bank of Salt Branch, 10 feet south of road, 15 feet northwest of 6-inch mesquite tree; iron post, marked "SA 1412".....	1,412.041
Cherokee, $4\frac{1}{2}$ miles east of; at junction with settlement road running northwest, nail in root west side 15-inch post-oak tree	1,451.01
Cherokee, $6\frac{1}{2}$ miles east of; in top of limestone outcrop 5 feet southeast of road at bend; aluminum tablet, marked "SA 1400".....	1,399.787
Cherokee, $7\frac{1}{2}$ miles east of; southeast side of road at junction with a dim settlement road running east, nail in root northeast side 6-inch mesquite tree	1,482.0
Davis Hollow, bed of.....	1,309.0
Cherokee, $9\frac{1}{2}$ miles east of; at junction of Mason and Lampasas road with San Saba and Bluffton road; iron post, marked "SA 1317".....	1,316.978

SOUTHWARD ALONG SAN SABA AND BLUFFTON ROAD TO BOYT'S RANCH.

Boyt's ranch, at southwest corner of fence inclosing yard at residence of T. W. Boyt, on east side of road; iron post, marked "SA 1461"	1,461.366
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SOUTHWARD ALONG SETTLEMENT ROAD, VIA TOW'S AND KUYKENDALL'S RANCHES, TO LLANO AND LAMPASAS ROAD.

Boyt's ranch, 2 miles east of; nail in crotch twin mesquite tree on east side of road near summit of hill.....	1,494.49
Boyt's ranch, 3 miles south of; on top of embedded limestone boulder 10 feet west of road at highest point of open prairie; bronze tablet, marked "SA 1501".....	1,501.039
Tow's ranch, $1\frac{1}{2}$ miles north of; chiseled square on top of flat limestone boulder, 30 by 12 inches, on east side of road.....	1,483.66
Falls Creek, south prong, bed of	1,372.0
Tow's ranch, $1\frac{1}{2}$ miles south of; in top of embedded limestone boulder 15 feet northwest of gate, southwest side of road; bronze tablet, marked "SA 1422".....	1,422.253
Tow's ranch, 3 miles south of; east side of road on summit of hill, divide between Falls and Miller creeks; iron post, marked "SA 1559"	1,558.810
Kuykendall's ranch, $\frac{1}{4}$ mile south of; west side of road, 500 feet north of log house, nail in base east side 10-inch mesquite tree.....	1,165.55
Lone Grove, $3\frac{1}{2}$ miles northeast of; 25 feet north of gate, west side of road at junction of Llano and Lampasas road with settlement road to Kuykendall's ranch; iron post, marked "SA 1141".....	1,140.772

TRIANGULATION AND SPIRIT LEVELING.

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SOUTHWESTERLY ALONG LLANO AND LAMPARAS ROAD TO LONE GROVE.

	Feet.
Intersection with Llano and Burnet road, ground at.....	1,067
Lone Grove, 150 feet west of post-office at, 5 feet south of fence in front of cotton gin on northeast bank of Little Llano Creek; iron post, marked "SA. 999".....	998.911

SOUTHWESTERLY ALONG SETTLEMENT ROAD AND BESSEMER IRON MINE SWITCH, TO AUSTIN AND NORTHWESTERN RAILROAD.

Lone Grove, 1½ miles southeast of; 150 feet north of Bessemer iron mine switch, 200 feet east of Little Llano Creek; nail in base east side 20-inch post of oak tree.....	983.44
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Llano to Cherokee, along public and settlement roads, via Field Creek.

NORTHWESTERLY ALONG LLANO AND BRADY ROAD TO FIELD CREEK.

Llano, 1 mile northwest of; south side of road on summit of hill; nail in root north side 30-inch live-oak tree.....	1,069.16
Pecan Creek, floor of bridge over.....	1,017.5
Pecan Creek, bed of	1,000
Hill west of Pecan Creek, ground at summit of.....	1,057
Llano, 2 miles northwest of; in middle of road at junction with road running south; staple in base of scrub live-oak tree.....	1,066.16
Llano, 3 miles northwest of; northeast side of road near summit of slight incline in front of leaning live-oak tree, 27 feet southeast of telephone pole; iron post, marked "SA. 1131"	1,130.892
Intersection with road running southwest at summit of hill, ground at...	1,173
Llano, 4 miles northwest of; spike in southwest side of first telephone pole northwest of small branch	1,152.22
Llano, 5 miles northwest of; spike in northeast side of third telephone pole northwest of milepost "To L. 5"	1,160.50
Llano, 6 miles northwest of; 3 feet west of northwest fence corner, 250 feet north of milepost "To L. 6" at bend in road from south to west; iron post, marked "SA. 1161".....	1,161.109
Willow Creek, bed of	1,140
Valley Spring, 5¼ miles southeast of; east side of gate on north side of road, 300 feet east of summit of hill; nail in root south side 24-inch dead post-oak tree	1,180.35
Valley Spring, 4¼ miles southeast of; southwest side of road at summit of hill; chiseled cross on pink granite boulder.....	1,211.83
Valley Spring, 3¼ miles southeast of; 150 feet southeast of gate, on northeast side of road, 35 feet west of 30-inch post-oak tree bearing mile board "To L. 9;" iron post, marked "SA. 1207"	1,207.161
Valley Spring, ¼ mile southeast of post-office at; in top of embedded granite boulder on south side of summit of hill, 200 feet southwest of Methodist Episcopal church; aluminum tablet, marked "SA. 1335" ...	1,234.677
Valley Spring, ground in front of post-office at	1,320
Johnson Creek, bed of	1,329
Valley Spring, 1½ miles northwest of; at junction with Mason and Burnet road; staple in crotch of twin post-oak tree utilized as milepost.....	1,332.04
Valley Spring, 2½ miles northwest of; north side of road at bend, 15 feet north of twin post-oak tree; iron post, marked "SA 1450"	1,449.657
Valley Spring, 4¼ miles northwest of; spike in base of second telephone pole east of fence angle south side of road.....	1,463.56

	Feet.
Valley Spring, 5½ miles northwest of; in top of limestone outcrop northeast side of road, 120 feet northwest of mile board "Llano 17 miles," opposite to R. Baumann's farm residence; aluminum tablet, marked "SA 1485".....	1,484.903
Cold Creek, bed of.....	1,376
Field Creek, 3½ miles southeast of; south side of road, 70 feet east of gate on opposite side of road; nail in base north side of telephone pole.....	1,384.13
Field Creek, 2½ miles southeast of; nail in base west side of telephone pole opposite to angle in road.....	1,409.62
Field Creek, 1½ miles southeast of; at northwest corner of intersection with settlement road running northeast and southwest, at summit of a small hill; iron post, marked "SA 1407".....	1,406.424
Field Creek, ¼ mile southeast of; nail in root west side 20-inch post-oak tree in middle of road at summit of hill.....	1,415.10
Field Creek schoolhouse, forks of roads at.....	1.407
Field Creek, in northwest corner of McLeod Appleton & Co.'s general store, 4 feet above ground; aluminum tablet, marked "SA 1414".....	1,413.985
NORTHEASTERLY ALONG SETTLEMENT ROAD, VIA WILSON'S RANCH, TO PONTOTOC AND SAN SABA ROAD.	
Field Creek, 1½ miles northeast of; 150 feet north of stone wall corner; nail in crotch of twin mesquite tree east side of road.....	1,537.46
Field Creek, 2½ miles northeast of; at junction of Pontotoc and San Saba road with settlement road ½ mile north of W. R. Wilson's ranch; iron post, marked "SA 1617".....	1,615.476
NORTHWESTERLY ALONG PONTOTOC AND SAN SABA ROAD.	
Field Creek, 3½ miles northeast of; west side of road at milestone "S. S. 26;" nail in root east side 16-inch post-oak tree.....	1,673.70
Field Creek, 4 miles northeast of; in top of embedded limestone boulder, east side of 18-inch blackjack tree, 20 feet east of road, 50 feet south of summit of hill; aluminum tablet, marked "SA 1784".....	1,783.701
Field Creek, 5½ miles northeast of; southeast side of road, 100 feet southwest of milestone "S. S. 24;" nail in root southeast side 12-inch post-oak tree.....	1,752.40
Field Creek, 7 miles northeast of; at junction with Mason and Lampasas road; iron post, marked "SA 1752".....	1,751.961
EASTWARD ALONG MASON AND LAMPASAS ROAD TO CHEROKEE.	
Cherokee, 11½ miles west of; north side of road near summit of hill; nail in root south side 33-inch live-oak tree.....	1,790.33
Cherokee, 9 miles west of; in top of embedded limestone boulder southeast side of road, 25 feet east of gate, 12 feet southeast of 14-inch live-oak tree; bronze tablet, marked "SA 1703".....	1,702.623
Cherokee, 5½ miles west of; on east side of road, 6 feet southeast of gate on division fence line between lands of A. R. Kuykendall and R. W. Gray; iron post, marked "SA 1615".....	1,614.457
Cherokee, 4½ miles west of; 250 feet west of Heck Spring Branch; nail in root north side 12-inch leaning live-oak tree.....	1,565.26
Heck Spring Branch, bed of.....	1,557
Cherokee Creek, bed of.....	1,550
Cherokee, 3 miles west of; south side of road, in front of corral, 80 feet west of gate; nail in root north side 10-inch elm tree.....	1,549.97
Cherokee, 2½ miles west of; on south side of road, 5 feet south of gate on division fence line between lands of R. W. Gray and George Gray; iron post, marked "SA 1551".....	1,550.734

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Cherokee, 1½ miles west of; 25 feet south of gate on summit of hill at end of land; nail in root north side 12-inch mesquite tree on fence line	1,587.86
Cherokee, road in front of post-office at	1,496

From point 1½ miles south of Cherokee, to Valley Spring, along Cherokee and Valley Spring road.

SOUTHWESTERLY ALONG CHEROKEE AND VALLEY SPRING ROAD.

Cherokee, 3¼ miles southwest of; north side of road by a wire fence, 6 feet north of gate; iron post, marked "SA 1531"	1,530.914
Cherokee, 4¼ miles southwest of; at junction with settlement road running west; nail in root southeast side 14-inch post-oak tree northwest side of road	1,549.17
Cherokee, 5½ miles southwest of; west side of road at summit of hill; nail in root west side 8-inch post-oak tree	1,522.68
Valley Spring, 5½ miles northeast of; in top of sandstone ledge 9 feet southwest of 10-inch elm tree, 35 feet northeast of Pecan Creek, east side of road; aluminum bolt, marked "SA 1412"	1,411.930
Pecan Creek, bed of	1,409.00
Valley Spring, 2¼ miles northeast of; at junction with a settlement road running southeast; iron post, marked "SA 1374"	1,373.841

Valley Spring to Llano, along public roads via Castell.

SOUTHWESTERLY ALONG MASON AND BURNET ROAD FROM JUNCTION WITH LLANO AND BRADY ROAD.

Valley Spring, 2 miles southwest of; 30 feet north of angle in stone wall; nail in root northwest side 18-inch post-oak tree on northwest side of road	1,358.73
Valley Spring, 4¼ miles southwest of; at junction with settlement road running west, 75 feet southwest of a small creek; iron post, marked "SA 1274"	1,273.938
Shoat Creek, bed of	1,252
Fernando Creek, bed of	1,242
Valley Spring, 5 miles southwest of; 100 feet south of Fernando Creek; nail in base west side 12-inch blackjack tree on east side of road	1,254.82
Valley Spring, 7¼ miles southwest of; south side of road, 5 feet west of gate at end of lane; iron post, marked "SA 1314"	1,314.018
Valley Spring, 9¼ miles southwest of; in top of pink granite outcrop west side of road, 40 feet north of summit of road at King Mountains; aluminum tablet, marked "SA 1424"	1,424.472
Valley Spring, 10¼ miles southwest of; nail in root east side 12-inch post-oak tree, south side of road, 40 feet west of small branch, and opposite to granite ledge	1,379.41
Valley Spring, 11½ miles southwest of; nail in root northwest side 18-inch live-oak tree, southeast side of road at summit of hill	1,392.08
Castell, 7 miles north of; at southeast corner of intersection of Mason and Burnet and Castell and Pontotoc roads; iron post, marked "SA 1326" ..	1,325.968

SOUTHWARD ALONG CASTELL AND PONTOTOC ROAD TO CASTELL.

Elm Creek, bed of	1,244.0
Castell, 6 miles north of; 150 feet south of Elm Creek, nail in root west side 12-inch live-oak tree, east side of road	1,259.34
Castell, 5 miles north of; 250 feet north of creek; nail in root west side 24-inch post-oak tree, east side of road	1,270.61
Creek, bed of	1,260.0

	Feet.
Castell, $3\frac{1}{4}$ miles north of; 3 feet east of gate on east side of road; iron post, marked "SA 1272".....	1, 271. 852
Junction with road running northwest to Fly Gap, ground at	1, 238. 0
Creek, bed of.....	1, 222. 0
Castell, $1\frac{1}{4}$ miles north of; nail in root west side 12-inch leaning blackjack tree, west side of road at summit of hill	1, 244. 97
Castell, $\frac{1}{2}$ mile north of; opposite to yellow farmhouse on north bank of Llano River; spike in base north side 10-inch leaning mesquite tree south side of road.....	1, 188. 71
Llano River, bed of, at ford.....	1, 155. 0
Castell, 5 feet north of southwest fence corner at "Traveler's Home," 75 feet east of T. Buchholz's general store and post-office; iron post, marked "SA 1207"	1, 207. 132

EASTWARD ALONG LLANO AND MASON ROAD TO LLANO.

Castell, 1 mile east of; nail in root north side 20-inch post-oak tree, south side of road at summit of hill.....	1, 229. 79
Lang Creek, bed of.....	1, 170. 0
Castell, $3\frac{1}{4}$ miles east of; 5 feet west of fence corner at junction with Loyal Valley road opposite 15-mile board ("15 miles to L. V"); iron post, marked "SA 1208".....	1, 208. 312
Westerlings Creek, bed of	1, 146. 0
Castell, $4\frac{1}{4}$ miles east of; 800 feet east of Westerlings Creek; nail in root south side 30-inch live-oak tree, north side of road.....	1, 175. 66
Summit of hill east of Westerlings Creek, ground at	1, 207. 0
Small Creek, floor of bridge over	1, 164. 5
Castell, 6 miles east of; 12 feet east of 12-inch elm tree northwest side of road, at point where lane runs north to river; iron post, marked "SA 1154"	1, 154. 167
Castell, $8\frac{1}{4}$ miles east of; 30 feet south of road on west bank of Hickory Creek; iron post, marked "SA 1111".....	1, 111. 048
Hickory Creek, bed of	1, 092. 0
Llano, $8\frac{1}{4}$ miles west of; 90 feet east of gate; nail in crotch twin post-oak trees in middle of road.....	1, 145. 56
Llano, $6\frac{1}{4}$ miles west of; bent nail in root south side twin post-oak trees in middle of road at summit of hill.....	1, 138. 26
Sixmile Creek, bed of	1, 073. 0
Llano, 6 miles west of; on north side of road, east bank of Sixmile Creek, 40 feet northeast of granite post, marked "To Llano 6 miles"; iron post, marked "SA 1085".....	1, 085. 291
Llano, 4 miles west of; southwest corner of bridge over a small creek, northwest side of road; nail in base southeast side 20-inch post-oak tree.	1, 050. 25
Llano, 3 miles west of; northwest side of road, at summit of hill, 100 feet northeast of milestone "To Llano 3 miles"; iron post, marked "SA 1083".....	1, 083. 523
Llano, 2 miles west of; north side of road 100 feet west of bend, near granite quarry; nail in root south side twin live-oak trees	1, 035. 35
Llano, 1 mile west of; 500 feet east of milestone "To Llano 1 mile"; nail in root north side 18-inch post-oak tree, north side of road	1, 046. 67
Flag Creek, bridge over.....	1, 011. 7

Oxford to House Mountain, along settlement roads via Bennett schoolhouse and Balcom's ranch.

WESTWARD ALONG SETTLEMENT ROADS.

Oxford, $\frac{1}{2}$ mile west of; north side of road in front of Morse's stone residence; nail in base south side 24-inch post-oak tree.....	1, 415. 55
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	Fect.
Oxford, 2 miles west of; east bank of small branch; nail in base south side 14-inch post-oak tree, south side of road.....	1,422.01
Oxford, 3½ miles west of; in top of sandstone boulder, 10 feet south of road at summit of hill; bronze tablet, marked "SA 1497".....	1,497.222
Oxford, 5 miles west of; nail in root east side 15-inch post-oak tree, south side of road opposite Rickerson's residence	1,410.38
Oxford, 6 miles west of; 100 feet northwest of Bennett's schoolhouse at fence corner, south side of road; iron post, marked "SA 1403".....	1,402.957
Oxford, 7 miles west of; nail in root south side 36-inch live-oak tree in front of Radcliff's farmhouse	1,359.46
Oxford, 8 miles west of; nail in root north side 16-inch live-oak tree, south side of road on summit of hill.....	1,392.65
Oxford, 9½ miles west of; in top of granite outcrop, 60 feet northwest of gate, at junction of old Llano and Fredericksburg road with a settlement road ¼ mile northeast of Bull Head Creek; aluminum tablet, marked "SA 1322".....	1,322.176

SOUTHWESTERLY ALONG OLD LLANO AND FREDERICKSBURG ROAD.

Bull Head Creek, bed of.....	1,272.0
Balcom's ranch, ¼ mile northeast of; at junction with settlement road running west to House Mountain; nail in root northeast side 16-inch live-oak tree	1,279.17

WESTWARD ALONG SETTLEMENT ROAD.

Balcom's ranch, ¼ mile west of; 100 feet east of small branch; spike in base south side 12-inch post-oak tree, south side of road	1,292.20
Balcom's ranch, 1½ miles west of; in top of pink granite outcrop, 2 feet above ground, northwest side of road, 450 feet southwest of junction with settlement road running south; aluminum tablet, marked "SA 1324".....	1,323.937
Balcom's ranch, 3½ miles west of; southeast corner of intersection with road running north and south; nail in base north side 22-inch post-oak tree	1,394.86
Balcom's ranch, 4 miles west of; in top of pink granite outcrop southwest side of road, 15 feet west of where road passes over bare road, 800 feet east of a small creek about 1 mile east of House Mountain; aluminum tablet, marked "SA 1345".....	1,344.614
Balcom's ranch, 5 miles west of; chiseled cross on pink granite boulder, south side of road at summit of hill near north end of House Mountain..	1,389.66
Balcom's ranch, 6 miles west of; on east bank of Hickory Creek, nail in crotch triple blackjack tree on north side of road	1,327.98
Hickory Creek, bed of	1,307.0

House Mountain to Enchanted Rock, along settlement roads via August Keese's ranch.

SOUTHEAST ALONG SETTLEMENT ROAD, VIA PUTNAM SCHOOLHOUSE, TO AUGUST KEESE'S RANCH.

Hayne's ranch, 3½ miles north of; at forks of roads ¼ mile northwest of Marshall Creek; iron post, marked "SA 1369".....	1,368.758
Marshall Creek, bed of.....	1,322.0
Cherry Spring Creek, bed of	1,365.0
Hickory Creek, bed of	1,375.0
Hayne's ranch, 300 feet south of Henry Hayne's residence, in top of pink granite outcrop west side of road; aluminum tablet, marked "SA 1425".....	1,424.917

	Feet.
Hayne's ranch, $\frac{1}{4}$ mile south of; 200 feet south of Putnam schoolhouse, nail in root south side 24-inch post-oak tree, northeast side of road.....	1, 447. 02
Putnam's ranch, $\frac{1}{4}$ mile northeast of; south side of road on summit of hill, 100 feet east of gate, nail in root east side 12-inch post-oak tree.....	1, 575. 33
Putnam's ranch, $\frac{1}{4}$ mile southeast of; in top of red sandstone ledge on northeast bank of Hickory Creek, 75 feet southwest of road; aluminum tablet, marked "SA 1525"	1, 525. 230
August Keese's ranch, $\frac{1}{4}$ mile southwest of; southeast side of road 100 feet southwest of gate, nail in base northwest side 12-inch mesquite tree...	1, 615. 24

EASTWARD THROUGH AUGUST KEESE'S PASTURE TO SETTLEMENT ROAD RUNNING NORTH AND SOUTH.

August Keese's ranch, south side of road, 500 feet south of residence, 100 feet east of gate, nail in root south side 6-inch hickory tree.....	1, 625. 69
August Keese's ranch, $\frac{1}{4}$ mile east of; 125 feet south of fence dividing lands of August Keese and H. Keese, in top of pink granite outcrop in small open flat, 250 feet west of settlement road running north and south; aluminum tablet, marked "SA 1749"	1, 749. 397

SOUTHWESTERLY ALONG SETTLEMENT ROAD TO LOYAL VALLEY AND WILLOW CITY SETTLEMENT ROAD.

Junction with Loyal Valley and Willow City settlement road, ground at.	1, 750. 0
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EASTWARD ALONG LOYAL VALLEY AND WILLOW CITY SETTLEMENT ROAD.

H. Keese's ranch, $\frac{1}{4}$ mile northeast of; in top of pink granite bowlder, north side of road, 18 feet northeast of gate; aluminum tablet, marked "SA 1724"	1, 724. 236
H. Keese's ranch, 1 mile east of; 100 feet southeast of stone house on north side of road, nail in root west side 21-inch live-oak tree	1, 767. 05
H. Keese's ranch, 2 miles east of; nail in root east side 10-inch live-oak tree, south side of road, 30 feet east of gate	1, 677. 37
H. Keese's ranch, 3 miles east of; in top of gray granite outcrop on north side of road; aluminum tablet, marked "SA 1691"	1, 690. 590
Enchanted Rock, 2 miles south of; nail in root east side 6-inch mesquite tree bearing sign "To En. Rock," at forks of roads	1, 693. 90

NORTHWARD ALONG SETTLEMENT ROAD TO ENCHANTED ROCK.

Enchanted Rock, $\frac{1}{4}$ mile south of; in top pink granite bowlder 30 feet south of road, 500 feet northeast of corrals at Morse's old ranch; aluminum tablet, marked "SA 1414"	1, 418. 811
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NORTHEASTERLY ALONG SETTLEMENT ROAD TO WATCH MOUNTAIN.

Enchanted Rock, $\frac{1}{4}$ mile northeast of; south side of road at bend, 200 feet southwest of forks on summit of hill, nail in root north side 16-inch live-oak tree	1, 438. 94
Watch Mountain, $1\frac{1}{4}$ miles south of; in top of gray granite outcrop 25 feet north of road, on south bank of small branch; aluminum tablet, marked "SA 1374"	1, 373. 805
Watch Mountain, $\frac{1}{4}$ mile east of; nail in root southwest side 8-inch leaning post-oak tree, south side of road at forks.....	1, 317. 80

EASTWARD FROM WATCH MOUNTAIN TO AARON MORSE'S RANCH.

Watch Mountain, $2\frac{1}{4}$ miles east of; in top of pink granite bowlder 20 feet northwest of road, 3 feet southeast of 30-inch post-oak tree, 450 feet southwest of Sand Creek, about $\frac{1}{4}$ mile west of Aaron Morse's ranch; aluminum tablet, marked "SA 1270"	1, 270. 064
Sandy Creek, bed of; opposite Morse's house.....	1, 225. 0

TRIANGULATION AND SPIRIT LEVELING.

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SOUTHEASTERLY FROM MORSE'S RANCH TO LLANO AND FREDERICKSBURG ROAD.

	Feet.
Morse's ranch, $\frac{1}{4}$ mile southeast of; northeast side of road 160 feet south-east of gate, bent nail in root southwest side 6-inch dead mesquite tree.	1, 273. 57
Crab Apple Creek, bed of.....	1, 164. 0
Morse's ranch, $2\frac{1}{4}$ miles southeast of; in top of pink granite bowlder, 10 feet west of 11-inch hickory tree on rocky hillside, south side of road, 200 feet southeast of Crab Apple Creek; aluminum tablet, marked "SA 1188".....	1, 287. 642

OTHER LOCALITIES.

Considerable leveling was done in the Black Hills Reserve, South Dakota and Wyoming; the Bighorn Reserve, Wyoming; the Uinta Reserve, Utah, and in the vicinity of Missoula, Montana; but as the work in these areas is to be continued, it is thought not advisable to publish the results until the work is completed, which, it is thought, will be accomplished during the season of 1899.

PACIFIC SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. Richard U. Goode, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in the various localities, as follows:

CALIFORNIA.

MONO AND TUOLUMNE COUNTIES.

MOUNT LYELL QU'ADRANGLE.

The elevations in the following list are based on an iron post set in 1896 at Hardy Station, the elevation of this post having been determined from mean bay level at Oakland, California, to be 6,940.949 feet.

The leveling was done under the general direction of Mr. R. B. Marshall, topographer, by Mr. C. R. Smith, levelman.

HARDY STATION, VIA CARSON AND BRIDGEPORT ROAD, TO BRIDGEPORT.

	Feet.
Hardy station, at the junction of the Sonora-Mono toll road and the Carson road, 60 feet east of Little Walker River; iron post, marked "6942 O"	6, 940. 949
Devils Gate Pass, west end of; big flat-top granite bowlder 20 feet west of road, marked "+ B. M. 7464 U.S.G.S.".....	7, 463. 6
Summit between Hardy and Bridgeport, 15 feet east of road; iron post, marked "7540 O".....	7, 539. 931
Swaugers Creek, at first crossing of; nail driven in notch of lone dead pine tree on left side of creek, blazed above mark "B. M. 7398 U.S.G.S."	7, 398. 35
Swaugers Creek, second crossing of; head of nail in root of big pine tree on lower side of bridge.....	7, 215. 5
Hunttoon's station, on right side of road, 100 feet below water trough; iron post, marked "6837 O".....	6, 837. 118

	Feet.
Swangers Creek, third crossing of; head of nail driven in top of highest end of right-hand guard rail on south approach to bridge.....	6,660.20
Bridgeport, 3 miles northwest of; east side of road, at north side of Simmons Lane; iron post, marked "6496 O".....	6,495.675
Bridgeport, at southwest angle of court-house; iron post, marked "6465 O".....	6,464.555
BRIDGEPORT, VIA BRIDGEPORT AND BODIE ROAD, GOAT RANCH ROAD, AND BODIE AND LUNDY ROAD TO MONO LAKE AND FARRINGTON.	
T. B. Rick's farm; nail in foot of heavy fencepost in front of blacksmith shop.....	6,540.00
Tollgate, Bridgeport and Bodie road, near northeast corner of gate; iron post, marked "6643 O".....	6,643.065
Dog Town road, at point of departure from Bodie road; nail driven in top of post of mail box; post stamped on side in large characters, "B. M. 6828, U.S.G.S.".....	6,827.53
Clearwater Creek Crossing; 20 feet north of bridge; iron post, marked "7196 O".....	7,196.442
Goat Ranch road, summit of; on embedded stone at right side of road, defined by ring of rocks roundabout.....	7,656.0
Sheep Camp, across the road from water trough and 50 feet above; iron post, marked "7350 O".....	7,349.943
Hector's Station, on Bodie and Lundy road, across the road from the dwelling house at edge of orchard and garden; iron post, marked "6760 O".....	6,760.441
Jordan Creek crossing of Bodie and Lundy road; 150 feet south of bridge on north side of road; iron post, marked "6779 O".....	6,778.526
Sec. 19, T. 2 N., R. 26 E., Diabolo meridian; 4 feet east of southwest corner of; witnessed by mound of rocks; corner is about midway between Mono post-office and Mono schoolhouse, on hillside, about 350 feet in elevation above lake and about 2,000 feet in horizontal distance from lake shore; iron post, marked "6761 O".....	6,760.833
Mono Lake post-office; head of nail in southeast corner of floor of porch of building; below on stringer is marked in large letters, "B. M. 6426, U.S.G.S.".....	6,425.78
Mono Lake; surface of water July 27, 1898.....	6,412.4
Mono Lake and Lake district road toll house, on front edge of water trough; on front of trough is marked, in large characters, "B. M. 6460, U. S. G. S.".....	6,459.93
Ney's ranch, near Mono Lake shore, in large boulder on north side of road and 200 feet east of blacksmith shop; aluminum tablet, marked "6423 O".....	6,422.590
Mono Lake; surface of water October 4, 1898.....	6,411.6
Leevining Creek, crossing of; head of nail in west end of right-hand guard rail of bridge; guard rail is marked "B. M. 6436, U.S.G.S.".....	9,435.539
J. P. Mattley's ranch, on top of drop box of irrigation ditch, on west side of road, marked "+ B. M. 6759, U. S. G. S." on top cross brace.....	6,758.9
Farrington station, 50 feet south of dwelling, inside of fence at edge of road to Walker Lake; iron post, marked "6854 O".....	6,853.848
LEEVINING CREEK BRIDGE, ALONG ROAD ON SOUTH SHORE OF LAKE TO MONO MILLS, THENCE OVER BODIE AND BENTON ROAD TO CRATER RIDGE ROAD, AND THENCE BY OWENS RIVER ROAD TO FARRINGTON STATION.	
Newman's ranch; bolt head driven in top of south west corner post of fence; post is marked underneath bolt, "B. M. 6430, U.S.G.S.".....	6,429.91
Rush Creek Crossing; junction of Lake road with Rush Creek road from Farrington Station; iron post, marked "6442 O".....	6,441.690

	Feet.
Mono Mills road, about 3 miles southeast of where road leaves lake shore, 15 feet to right of road and about 200 feet east of foot of spur of Crater Ridge; iron post, marked "6899 O"	6,898.821
Mono Mills, in northwest corner post of sawmill; aluminum tablet, marked "7335 O"	7,335.068
Bodie and Benton wagon road, on summit between Mono Lake and Owens River drainage, 20 feet east of road; iron post, marked "7987 O"	7,986.868
Crater Ridge, summit of cut-off road over; on conical boulder 20 feet left of road, marked "+ B.M. 7998 U.S.G.S."	7,998.7
Long Valley and Owens River road, at junction of with Bodie and Benton wagon road on north side of road; iron post, marked "7938 O"	7,938.101
Owens River road, about 7 miles southeast of Farrington station, at head of short, steep grade, at upper edge of grove of trees 10 feet left of road; iron post, marked "7601 O"	7,600.946
Rush Creek bridge, about 1½ miles southeast of Farrington station; on head of spike in center of right-hand guard rail of bridge, marked "+ B.M. 6853 U.S.G.S."	6,853.38

FARRINGTON STATION, VIA PRIVATE ROAD UP RUSH CREEK, TO SILVER LAKE.

Grant Lake, at outlet of, 10 feet east of road; iron post, marked "7068 O" ..	7,068.347
Silver Lake, outlet of; iron post, marked "7217 O"	7,217.056

MONO LAKE AT NEY'S RANCH, UP LEEVINING CREEK WAGON ROAD TO F. M. CHIPMAN'S RANCH.

L. V. C. H. M. Company's ditch, opposite initial point of, on left bank of Leevining Creek, on embedded white granite stone 10 feet left of road ..	6,898.5
Wood's and McNeff's ranches, line fence between, on nail in left-hand guidepost; post marked above nail, "B.M. 7380 U.S.G.S."	7,379.93
Leevining Creek, on floor of bridge over	7,376
Secs. 23 and 24, T. 1 N., R. 26 E., at ¼ corner between; iron post, marked "7467 O"	7,467.216

FARRINGTON STATION, ALONG WAGON ROAD TO WALKER LAKE.

Farrington's lower pasture, nail in gatepost of south fence, on left side of road; post is marked above nail "B.M. 7036 U.S.G.S."	7,036.33
Farrington's upper pasture, nail in gatepost of north fence, on left side of road; post is marked above nail "B.M. 7789 U.S.G.S."	7,789.05
Walker Lake, 100 feet north of outlet of, at upper end of wagon road where Bloody Canyon trail begins, near dwelling of A. Grose, 100 feet from lake and 123 feet from fence; iron post, marked "7929 O"	7,929.149
Walker Lake, surface of water September 1, 1898	7,926.7

WALKER LAKE, VIA BLOODY CANYON TRAIL AND TIOGA ROAD, TO SNOW FLAT.

Small summit, over which trail passes to drop into creek bottom beyond, on rock outcropping at foot of tamarack tree, 4 feet to left of trail; rock is marked by + and tree above is marked "B.M. 9077 U.S.G.S."	9,077.462
Sardine Lake, surface of water September 26, 1898	9,876.2
Mono Pass, 30 feet north from shore of Summit Lake and 4 feet to right of trail; iron post, marked "10599 O"	10,598.723
Dana Fork, Spring Branch flowing into; first stream of flowing water crossing, about 300 feet beyond foot of sidehill grade on pyramidal blue granite rock, marked with +	9,919.44
Dana Fork, trail at point where sheep trail branches to the right through the timber along sidehill and where the stream turns sharply westward to main trail, continuing northwest down to meadows, in rock at southwest corner of log cabin; aluminum plug, marked "U.S.G.S. 9738 Ft. B.M.O."	9,737.682

	Feet.
Soda Springs, $3\frac{1}{4}$ miles east of; on north side of Tioga road where trail comes in from the meadows to the eastward of said road in outcropping ledge of rock; aluminum plug, marked "U.S.G.S. 9270 Ft. B.M.O." ...	9,269.913
Soda Springs, $1\frac{1}{4}$ miles east of; on Tioga road, at foot of steep grade, on nail in foot of large tamarack tree on right side of road; blaze on tree above nail, marked "B.M. 8676 U.S.G.S."	8,675.79
Soda Springs, 100 feet west of; in large granite boulder on south side of trail; aluminum bolt, marked "U.S.G.S. 8594 Ft. B.M.O."	8,593.8
Secs. 1 and 12, T. 1 S., R. 23 E., and secs. 6 and 7, T. 1 S., R. 24 E., Diabolo meridian, corner of; iron post, marked "8555 O"	8,555.237
Cathedral Creek, crossing of; nail in foot of dead tree on left side of Tioga road and north side of creek; place above nail is marked "B.M. 8342 U.S.G.S."	8,341.672
Cathedral Creek, in conspicuous rock in north side of creek bed, 50 feet from road; aluminum bolt, marked "U.S.G.S. 8337 Ft. B.M.O."	8,337.195
Lake Tanaya, at head of steep grade descending toward, on face of large boulder at west side of road about 200 feet before reaching spring flowing from hillside; mark is defined by a large horizontal red line on face of stone about 4 feet from ground; stone is marked "B.M. 8378 U.S.G.S." ..	8,377.8
Lake Tanaya, on west shore of; in large boulder between road and lake shore, about 300 feet east of three log cabins in grove of trees; aluminum tablet, marked "U.S.G.S. 8146 Ft. B.M.O."	8,145.566
Lake Tanaya, surface of water, date September 17, 1898	8,141
Lake Tanaya and Snow Flat drainage, summit between, on large square granite boulder on right side of road, at point where road turns to the southwest descending toward Snow Flat	8,845.2
Snow Flat, 300 feet southwest of wooden culvert in road crossing, in large granite boulder on west side of road; aluminum tablet, marked "U.S.G.S. 8705 Ft. B.M.O."	8,705.460

DANA FORK TRAIL, VIA ROAD TO TIOGA.

Tioga road, about $\frac{1}{4}$ mile east of wood-chopper's cabin, on large isolated white granite boulder, marked on top by chiseled +	9,785.7
Tioga Pass summit, on rock on east side of road; aluminum bolt, marked "U.S.G.S. 9941 Ft. B.M.O."	9,941.307
Tioga mine, in ledge of rock at southwest corner of assay office on round iron plug set in cement and marked "9795"	9,794.864

RIVERSIDE AND SAN DIEGO COUNTIES.

ELSINORE, SAN LUIS REY, AND SAN DIEGO QUADRANGLES.

The elevations in the following list are based on a continuation of the levels of the preceding field season, which started from a United States Coast and Geodetic Survey bench mark at San Pedro. A closure connection was obtained on two bench marks in the vicinity of San Diego, with the following results:

	U. S. C. and G. S.	U. S. G. S.	Difference.
Point Loma, San Diego Bay	8.455	8.046	0.409
San Diego, Creigne's brick building	12.11	11.457	0.653

As the bench mark at Point Loma was based on tidal observations extending over a longer period of time than that at San Diego, the former was selected as the one more nearly correct and the results adjusted to it, including the bench marks in San Diego.

The work was done by Mr. George H. Herrold, levelman, duplicate rods being used.

TEMECULA TO RAINBOW POST-OFFICE.

	Feet.
Temecula, in the west foundation wall of schoolhouse; bronze tablet, marked "1019".....	1,018.951
Santa Margarita River, 150 feet west of, on south side of Palla road, 175 feet southeast of junction with Rainbow road; wire nail in root of willow tree.....	992.0
Temecula, 3½ miles southeast of, east side of road, in north face of granite boulder 18 feet high and 12 feet broad; copper bolt, marked "U.S.G.S. 1155 Ft.".....	1,155.085
Summit on road between Temecula and Vallecitos valleys.....	1,311.6
Summit, 150 feet south of, east side of road; circle chiseled on 5 by 5 foot boulder 2 feet high.....	1,305.68
Rainbow post-office, 1½ miles north of, on west side of Temecula road, in south end of boulder 2½ feet high, 15 feet long, and 5 feet wide, under a double oak tree in fence line; copper bolt, marked "U.S.G.S. 1164 Ft. B.M.".....	1,164.081
Rainbow post-office, floor of bridge north of.....	1,050.7
Rainbow post-office, water trough in front of; tack in 4 by 4 inch sill....	1,047.36

RAINBOW POST OFFICE, VIA MONSERATTE CATTLE COMPANY'S RANCH, TO BONSALE.

Rainbow, at northeast corner of Vallecitos schoolhouse grounds; iron post, marked "1044".....	1,043.996
Rainbow post-office, 1½ miles south of, in canyon, on west side of San Diego road; wire nail in root of oak tree 4 inches in diameter.....	884.62
Divide between Vallecitos and San Luis Rey river valleys, 400 feet west of; wire nail in root of 18-inch oak tree on south side of road.....	1,011.91
Rice's house, between road and; wire nail 6 feet above ground in knot in large double oak tree.....	865.33
San Luis Rey River, 2 miles north of, east edge of road and west side of canyon; wire nail in root of 40-inch oak tree.....	632.40
NW. corner T. 10 S., R. 2 W., 200 feet south of oak tree on west side of Rainbow-Bonsall road at junction with Palla road; iron post, marked "290".....	290.035
San Luis Rey River, north bank of, on north side of Bonsall-Palla road, in granite boulder; copper bolt, marked "U.S.G.S. 274 Ft. B.M.".....	274.160
Monseratte Cattle Company's ranch, 275 feet south of river ford, on east side of road; wire nail in west root of 48-inch oak tree.....	257.51
El Dorado, adobe ranch house, summit in road opposite.....	270.5
Loveland's house, southwest of, in small grove on north side of Bonsall road; wire nail in south root of double sycamore tree.....	226.07
Gird ranch, at west end of fenced road through, 1½ miles northeast of Bonsall; wire nail in crotch of triple sycamore tree.....	198.24
Bonsall, in center of street north of post-office, in top of boulder 12 feet in diameter, 6 feet high; copper bolt, marked "U.S.G.S. 172 Ft. B.M."..	172.121

BONSALE TO VISTA.

Bonsall, porch floor at south end of street, with sign "Bonsall".....	169.71
Bonsall, 2 miles southwest of, north of and opposite cottage on Vista road; wire nail in trunk of pepper tree, 1 foot above ground.....	140.68

	Feet.
Bonsall, 2½ miles southwest of, at junction of Vista and Oceanside roads, near fence corner; iron post, marked "155".....	155. 173
Delpi schoolhouse, 1½ miles north of, in north corner of eucalyptus grove, 60 feet west of Bonsall-Vista road; wire nail in root of blazed tree.....	382. 62
Delpi schoolhouse grounds, northwest corner of; iron post, marked "491"...	491. 106
Delpi schoolhouse, ¼ mile southwest of, on east and west road; wire nail in top of 3 by 6 inch bulkhead post at southwest corner of culvert	425. 26
Vista, ¼ mile north of, at junction of Delpi and Escondido roads, on west side of road; wire nail in brace post at angle in fence line.....	340. 47
Vista, 50 feet northeast of Escondido Branch railroad track, on southwest side of county road, in row of eucalyptus trees east of railroad crossing; iron post, marked "330".....	330. 170

VISTA, VIA SOUTHERN CALIFORNIA RAILWAY, TO ESCONDIDO.

Vista, top of rail at road crossing.....	323. 01
Vista, ¼ mile southeast of; wire nail in north end of east bulkhead board of trestle No. 27, Southern California Railway.....	424. 81
Vista, 2 miles southeast of; top of rail at road crossing.....	495. 70
Vista, 2½ miles southeast of; summit on railroad	520. 0
Vista, 2½ miles southeast of; wire nail in west end of south bulkhead board of culvert No. 35.....	494. 19
Buena Station, wire nail in top of bulkhead board at southeast corner of trestle No. 38	446. 34
Trestle No. 43, Southern California Railway, north end of, 2 feet lower than rail base; wire nail in east end of floor beam.....	524. 03
San Marcos, ¼ mile northwest of station; summit on railroad	578. 9
San Marcos, close to schoolhouse building, in angle of porch and building in front; iron post, marked "582"	582. 126
San Marcos, opposite north corner of station; wire nail in top of 4 by 4 inch clearing post 1.2 feet high	570. 74
San Marcos, 1.2 miles east of station; wire nail in top of 16 milepost.....	581. 86
San Marcos, 1½ miles southeast of station; top of rail at road crossing....	577. 32
Richland Station, in row of eucalyptus trees at southern corner of school grounds, 50 feet northeast of track and 35 feet northwest of road center; iron post, marked "634"	634. 22
Richland Station; top of rail at road crossing	628. 73
Summit between Richland and Escondido; hub and tack 2 feet south of W. X. post, north of railroad crossing.....	691. 48
Escondido River, north end of trestle No. 59; wire nail in west end of floor beam 2 feet below rail bottom.....	636. 98
Escondido, north side of station and close to building; wire nail in bottom board of sloping platform.....	640. 97
Escondido, northeast corner of iron footplate of step at entrance to drug store, on lot 15, next to bank and post-office building, on Main street; official city bench mark	653. 961
Escondido, in north wall of main entrance corridor in basement of college building on hill, 4 feet above ground; bronze tablet, marked "754".....	754. 248

ESCONDIDO, VIA BERNARDO, TO GREEN VALLEY.

Escondido, 1 mile south of, north corner of road intersections; wire nail in root of eucalyptus tree	660. 69
Escondido, 2½ miles south of, on San Diego road at junction; iron post, marked "530"	530. 259
Bernardo post-office, 1½ miles north of, on south bank of creek, 50 feet east of small bridge; wire nail in crotch of large double sycamore tree.	410. 42

TRIANGULATION AND SPIRIT LEVELING.

463

	Feet.
Bernardo post-office, 625 feet north of Bernardo River bridge, on west side of county road; iron post, marked "319"	319. 283
Bernardo River bridge, floor of, San Diego and Escondido road	303. 07
Bernardo post-office, 1 mile south of, at head of grade in canyon; hub and tack west side of road, between brace and telegraph pole	461. 94
Bernardo post-office, 1½ miles south of; summit on San Diego road	506. 8
Bernardo, 2½ miles south of; hub and tack 1 foot east of first blazed telegraph pole north of summit	515. 84
Summit between Bernardo River and Green Valley, on San Diego road	510. 0
Green Valley, in sloping boulder 4 feet high, east of large boulder pile, west side of San Diego road and 80 feet north of bridge; copper bolt, marked "U.S.G.S. 482 Ft. B.M."	482. 276

GREEN VALLEY, VIA SAN DIEGO ROAD AND MERTON POST-OFFICE, TO VIRGINIA.

Green Valley, bridge across drainage	477. 63
Summit between Green Valley and Poway Valley, 15 feet east of road; point chiseled on rock 18 inches in diameter	642. 93
Watson's ranch, 5 feet east of fence corner, north side of Poway road, at junction with San Diego road; iron post, marked "583"	585. 291
Merton, 1 mile north of, opposite well on Lawson's ranch; wire nail in eucalyptus tree on east side of road	491. 52
Merton post-office, north of; bridge floor	447. 4
Merton post-office, southeast corner of junction of Poway and San Diego road; iron post, marked "438"	438. 29
Twenty Mile House, 25 feet north of; wire nail in root of 12-inch oak tree on west side of road	466. 98
Poway grade, hub and tack on west edge of road where it turns east into Mirror Canyon, leaving telegraph poles to the west	641. 6
Poway divide, on south side of road; iron post, marked "967"	967. 327
Tower's ranch, east side of circular concrete reservoir in San Clemente Valley; wire nail in northeast corner of concrete water trough, between concrete and wood casing, 1.5 feet above ground	655. 56
Virginia, 1½ miles southwest of Tower's house, near forks of road; wire nail in west end of "A" culvert	591. 83
Virginia post-office, ¼ mile southwest of, in forks of road where road down valley leaves San Diego road; iron post, marked "578"	578. 349

FROM VIRGINIA, VIA LINDA VISTA MESA, TO HEAD OF MURRAY CANYON GRADE.

Miramar road, junction with San Diego-Escondido road, where private telephone line comes into main road; hub and tack between telephone pole and brace pole on east side	444. 32
McKinnie, Flirt & Winsby 10-mile sign, ¼ mile south of; wire nail in west corner of road culvert	416. 94
Linda Vista Mesa, junction of Escondido and Linda Vista road, 8½ miles north of San Diego; iron post, marked "417"	416. 893
Rosedale, hub and tack 2.3 feet east of telegraph pole just south of Rose-dale sign on Escondido-San Diego road	415. 96
Rosedale, 1 mile south of, at angle in road; wire nail in brace to telegraph pole 8 inches above ground	410. 63
Linda Vista Mesa, head of grade out of Mission Valley; wire nail in brace pole to telegraph pole	391. 11
Linda Vista Mesa, head of grade out of Mission Valley, on east side of Escondido road and south end of the mesa road; iron post, marked "394"	393. 907

FROM HEAD OF MURRAY CANYON GRADE, VIA COUNTY HOSPITAL, TO OLD TOWN.

	Feet.
Junction of Main and Minor canyons, road from mesa down into Mission Valley; hub and tack off of road on north side	254.87
San Diego River, north bank of, south of Roe's adobe house; wire nail in root of eucalyptus tree in fence line east of road	30.05
San Diego River bed	22.7
Road culvert, south of river and north of hospital; wire nail in northwest end of	25.653
County hospital, north of, west side of road to San Diego and 40 feet south of road to Old Town; iron post, marked "28"	27.978
San Diego water works, concrete pavement center of gateway	16.91
Old Town, San Diego River wagon bridge; tack in concrete of southeast pier on east edge	17.68
Top of rail, crossing of Santa Fe and Old Town motor tracks	14.2
Old Town, south and east of motor track, in the west wall at the northwest corner of brick building, 2.6 feet above porch floor; copper bolt, marked "U. S. G. S. 44 Ft. B. M."	43.985

FROM OLD TOWN, VIA PACIFIC BEACH MOTOR TRACK, TO SAN DIEGO.

Old Town, southwest of, in tide flats, at west end of graded road to Point Loma; wire nail in northeast corner of culvert	1.06
Roseville, at southeast corner of fenced school grounds; iron post, marked "35"	34.985
Quarantine station on Point Loma, north of; United States Coast Survey bench mark, a granite block 10 by 10 inches on top, marked "U. S.;" north side marked "Ref. Mark;" east side marked "Coast Survey;" south side marked "1853-54-55;" north side marked "for tide"	8.455
Old Town, 1 mile south of; road crossing on motor track	50.33
Middletown, summit of motor track, at west corner of lot fenced with evergreen, between Palm and Quince streets; railroad spike flush with ground, driven into telegraph pole	69.71
Trestle on motor track; wire nail in east end of south floor beam	34.49
San Diego court-house, in the foundation pier north of southeast corner of east wing, 4 feet above ground; bronze tablet, marked "42"	42.010
San Diego, official city datum, City Hall building, corner Third and D streets, north corner of stone steps. (This bench mark was connected with the United States Coast and Geodetic Survey bench mark at Point Loma by the city engineer in 1888, the result being an elevation of 45.819 feet above mean sea level.)	45.772
San Diego, United States Coast Survey bench mark, in brick wall of west front of Creigne's building, 2 feet above step north of door, corner Fourth and K streets. (The elevation of this bench mark referred to the United States Coast and Geodetic Survey bench mark in San Diego is 12.11 feet, or a difference of 0.244 foot, as referred to the Point Loma bench mark.)	11.866

The elevations in the following list refer especially to the north half of the San Luis Rey quadrangle. The work was done with a single rod by Mr. C. C. Ward, levelman, under the general direction of Mr. L. C. Fletcher, topographer, and was based on the line previously mentioned as having been run by Mr. Herrold.

TAMECULA, VIA LINDA ROSA, TO DE LUZ STATION.

	Feet.
Temecula, 1 mile northwest of; nail in telegraph pole at forks of road to north	1,013.96
Linda Rosa, $\frac{1}{4}$ mile northeast of; northeast of forks of road; iron post, marked "1033 T"	1,032.837

	Feet.
Linda Rosa, $\frac{1}{4}$ mile southwest of; in mouth of canyon; cross cut in top of 2 by 2 foot sandstone boulder west of road	1,273.56
Linda Rosa, 1 mile southwest of; 150 feet northwest of road at summit; nail in 36-inch oak tree	1,500.11
Outing, 1 mile east of; at summit, about 500 feet south of forks of road, 10 feet east of road; iron post, marked "1462 T"	1,461.985
San Dias Canyon, in forks of Linda Rosa and Fallbrook road and road to De Luz; iron post, marked "837 T"	836.722
De Luz, $3\frac{1}{2}$ miles northeast of; at forks of canyon; wire nail in root of 15-inch oak tree 10 feet northwest of road	653.65
Santa Rosa ranch, 350 feet south of south gate to; spike in root of 18-inch oak tree	592.52
De Luz, 225 feet south of post-office; wire nail in root of 10-inch oak in forks of road	447.50
De Luz, $1\frac{1}{2}$ miles southwest of; 30 feet west of forks of road to schoolhouse (De Luz), in bed rock; copper bolt, marked "379 T"	379.209
De Luz, $1\frac{1}{2}$ miles southwest of; at forks of new road to Fallbrook; + cut in top of granite boulder	378.50
De Luz station, $1\frac{1}{2}$ miles north of; about 900 feet south of forks of creek; wire nail in root of 10-inch willow tree west of road	191.34
De Luz station, 12 feet northwest of switch south of; iron post, marked "148 T"	146.125

RAINBOW, VIA FALLBROOK, FALLBROOK STATION, AND SOUTHERN CALIFORNIA RAILWAY, TO DE LUZ STATION.

Red Mountain ranch, just east of; northwest of forks of road; iron post, marked "1063 T"	1,062.960
Red Mountain ranch, at northwest corner of, in northwest corner of bend of road; nail in root of 8-inch eucalyptus tree	900.27
Fallbrook, 2 miles east of, west of forks of road; nail in root of 12-inch eucalyptus tree	918.70
Fallbrook, $\frac{1}{4}$ mile northeast of, at fence corner in bend of road; circle cut in top of 2 by 2 foot boulder 1 foot above ground	771.98
Fallbrook, 50 feet north of schoolhouse, south side of Elder street; iron post, marked "732 T"	731.960
Fallbrook station, 40 feet east of trestle 32; spike in top of post south of track	306.53
Trestle 28; top of tie	242.9
Trestle 27; top of tie	241.7
Trestle 26, 250 east of, 8 feet south of track; railroad spike in root of 24-inch sycamore tree	239.69
Trestle 23, top of tie	203.3
Trestle 20, top of tie	172.1
Trestle 19, top of tie	174.0

DE LUZ STATION VIA YSADORA TO SAN LUIS REY.

Trestle 13, top of tie	116.8
Trestle 12, top of tie	101.9
Santa Margarita ranch house; southwest corner of retaining wall around, in middle pin; bronze tablet, marked "87 T."	86.957
Trestle 7, north end of; spike in northwest end of mud sill	54.04
Trestle 5, south end of; spike in west end of mud sill	33.61
Ysadora, 40 feet east of track, north side of road at fence corner; iron post marked "23 T."	22.879

	Feet.
San Luis Rey, 30 feet north of fork of roads at hotel; nail in root of eucalyptus tree east side of road	47.48
San Luis Rey, northeast corner of grounds around schoolhouse; iron post, marked "76 T."	75.879

YSADORA VIA LAS FLORES TO LAS PULGAS CORRAL.

Ysadora, 1 mile west of; in forks of small drainage, 3 feet west of road; nail in root of 12-inch cedar stump	192.00
Ysadora, 1½ miles west of, north of road at summit; iron post, marked "411 T."	410.996
Ysadora, 4½ miles northwest of; spike in base of sign post at forks of road.	172.17
Las Flores, 10 feet southwest of water tank, east of track; iron post, marked "84 T."	84.037
Las Flores Creek, north end of railroad trestle over; spike in east end of cap	50.69
Las Flores Creek, east bank of, 300 feet west of dam; nail in root of 24-inch sycamore tree	115.44
Las Pulgas Corral, northeast corner of; spike in post	259.83
Las Pulgas Corral, ¼ mile northeast of; east side of Las Flores Creek on side of hill; iron post, marked "293 T."	292.945

TEMECULA, EASTWARD UP TEMECULA RIVER TO VICINITY OF PAUBA GRANT.

Temecula, 3 miles east of, at spring, 70 feet south of old Pauba road; nail in root of 10-inch cottonwood	1,031.52
Pauba ranch house, ½ mile south of, northeast of forks of road; iron post, marked "1090 T."	1,090.073
Temecula, 6½ miles east of, east of irrigating ditch and double fork road, north of road; iron post, marked "1161 T."	1,161.002
Temecula, 8½ miles east of, southeast corner of private road crossing, just west of dry wash of Temecula River; iron post, marked "1228 T."	1,228.075

MONSERATE SCHOOLHOUSE VIA PALA TO VICINITY OF PAUMA RANCH.

Monserate schoolhouse, 2 feet south of, under window; iron post, marked "351 T."	351.028
Monserate schoolhouse, 1 mile north of; dry bed of San Luis Rey River at road crossing	279.5
Pala, ½ mile west of, south of forks of road; nail in 14-inch sycamore....	379.02
Pala, 10 feet south of southwest corner of mission; iron post, marked "411 T."	410.974
Pala, 1½ miles east of, at fork of road to Aqua Tibia ranch, northeast of road; iron post, marked "568 T."	568.330
Pala, 3 miles east of, fork of road to Pala Mills, north of road; iron post, marked "557 T."	557.029
Pala, 4 miles east of, 175 feet east of private road to Aqua Tibia ranch, north of road; nail in root of 10-inch sycamore	687.88
Pauma ranch, southeast of fork of road to ranch house; iron post, marked "758 T."	758.008
Pala, south on old San Diego road, San Luis Rey River, dry bed at road crossing	377.0
Pala, 1 mile south of, east of forks of road; top of bolt in base of telephone pole	396.25
Pala, 2 miles south of, northeast of forks of road; iron post, marked "481 T."	481.099

TRIANGULATION AND SPIRIT LEVELING.

467

BONSAL, UP MOOSSA CANYON, TO MOOSSA POST-OFFICE.

	Feet.
Bonsal, 4½ miles east of, 30 feet northeast of forks of road; spike in root of 4-inch live-oak tree	286.49
Moossa schoolhouse, ¼ mile west of, at forks and south of road; spike in root of 30-inch oak tree.....	423.33
Moossa, 15 feet southwest of house next east of post-office; iron post, marked "458 T.".....	458.121

SAN LUIS REY, NORTHWARD.

San Luis Rey, 2½ miles northeast of, windmill 75 feet east of road; nail in base of northwest corner	71.12
San Luis Rey River, bed of, on section line between secs. 3 and 4, T. 11 S., R. 4 W	76.0
Secs. 3 and 4, T. 11 S., R. 4 W., and secs. 34 and 35, T. 10 S., R. 4 W., at forks of road, 24 feet northeast of, on opposite side of road; iron post, marked "112 T.".....	112.014

SAN BERNARDINO COUNTY.

HESPERIA AND DEEP CREEK QUADRANGLES.

The elevations in the following list are based on a bronze tablet in the northwest foundation of the court-house in San Bernardino, the elevation of which was accepted as 1,047.758 feet, the latter elevation having been previously determined from a connection with a tidal bench mark at San Pedro.

The leveling was done by Mr. C. R. Smith, under the direction of Mr. W. T. Turner.

SAN BERNARDINO, ALONG SOUTHERN CALIFORNIA RAILWAY, TO VICTOR.

	Feet.
Highland Junction, 200 feet northward from; red line on white post.....	1,143.1
Baseline road; red line on white road crossing sign post.....	1,194.1
Verdemont, 2.8 miles southward from, 50 feet east of track at point where three wagon roads pass over one common crossing; iron post, marked "1420 S. B."	1,420.075
Verdemont, in center of north sill of railroad water tank; head of spike..	1,742.13
Glen Helen ranch, ¼ mile eastward of, where county road crosses railroad track; red line on white crossing post.....	1,956.9
Glen Helen ranch, on east side of county road; iron post, marked "2008 S. B.".....	2,008.476
Keenbrook, in front of section house; on top of clearance post	2,477.4
Keenbrook, 1½ miles northward from; on inner corner of parapet of retaining wall at north end of plate girder bridge.....	2,629.1
Coey Dell road station, inside of garden fence east of county road; iron post, marked "2768 S. B.".....	2,767.615
Cajon, on sill of railroad water tank; defined by red cross at foot of north-west post.....	2,922.9
Section house No. 33; on top of center post of rail rack opposite.....	3,472.1
Cajon, 4½ miles north of, at point where county road recrosses railroad track, west side of track; iron post, marked "3685 S. B.".....	3,684.810
Summit Station, on plank of road crossing over main track.....	3,822.8
Summit Station, 1.87 miles north of, where first wagon road crosses railroad; horseshoe nail driven into face of white crossing signpost.....	3,734.7

	Feet.
Summit Station, 5.2 miles north of, where second wagon road crosses railroad, 40 feet west of track and 20 feet north of wagon road; iron post, marked "3462 S. B."	3,462.446
Hesperia, 1½ miles south of, top of railroad whistle post on east side of track, where wagon road comes in close to the track from the east.....	3,300.6
Hesperia, 1½ miles south of, nail in road crossing signpost	3,267.6
Hesperia, at northeast corner of brick hotel building; iron post, marked "3190 S. B."	3,190.184
Hesperia, 4¼ miles north of; cross on north end of coping of small cement culvert west side of track	2,856.26
Hesperia, 6 miles north of, nail head in foot of crossing post	2,761.66
Victor, 60 feet north of wagon bridge over Mojave River and 60 feet west of railroad track; iron post, marked "2723 S. B."	2,722.650

HESPERIA, VIA BEAR VALLEY ROAD, TO POINT 6 MILES SOUTHEAST OF COXEY'S RANCH.

Mojave River, on west bank of, notch cut in butt of lone cottonwood tree	2,889.35
Mojave River, dry bed	2,887.0
Mojave River, on brow of first bench land east of, 4 feet north of Bear Valley road; iron post, marked "3097 S. B."	3,096.441
Hesperia, 7¼ miles east of, on large embedded gray boulder north of road; chiseled cross on top	3,218.3
Hesperia, 9¼ miles east of, where second branch road turns off to northeast toward Rabbit Springs, the Bear Valley road turning southeast to Rock Springs; wooden plug	3,419.7
Hesperia, 10.85 miles east of, on brow of hill before road drops down into gulch, on right side of road; wooden hub	3,629.0
Rock Springs, in triangle of roads; iron post, marked "3748 S. B."	3,747.481
Rock Springs, 1.1 miles southeast of, embedded stone 4 feet left of road on second summit	4,399.6
Rock Springs, 3 miles southeast of, on third summit, on round outcropping of granite 6 feet left of road	5,282.1
Rattlesnake Spring; ground at	5,349.0
Rattlesnake Spring, 0.2 mile south of, on round embedded boulder on left side of road at short turn to right, beyond third pine tree on left side of road	5,523.9
Rattlesnake Spring, 1 mile southeast of, at small summit of road on embedded stone north side of road, ring of rocks roundabout	5,732.6
Horse Springs, surface of water inside of small dam	5,587.0
Horse Springs, 0.55 mile southeast of, on first summit beyond, on embedded stone on left side of road	5,696.7
Horse Springs, 1.15 miles southeast of, on third summit beyond, on embedded stone left side of road	5,783.2
Coxey's ranch, in corner of garden fence; iron post, marked "5619 S. B." ..	5,619.053
Coxey's ranch, 1.9 miles southeast of, on second summit of spur, on nail driven in blazed piñon tree on left side of road	6,230.54
Coxey's ranch, 2.2 miles southeast of, on embedded stone left side of road on fourth and easternmost summit of spur whence road descends into left side canyon by sidehill grade	6,390.8
Coxey's ranch, 4.2 miles southeast of, at head of spring gulch; on nail in foot of pine tree right side of road	6,799.0
Coxey's ranch, 4.3 miles southeast of, at point where road to Pine Flat branches off, in forks of road; iron post, marked "6823 S. B."	6,822.943
Coxey's ranch, 5.1 miles southeast of, on nail in foot of big pine tree 30 feet left of road, at point where road enters another left-hand gulch.....	7,000.65

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Coxey's ranch, 6 miles southeast of, on summit of low spur before road drops down into Greenhead mining camp, on nail in foot of mountain mahogany tree on left side of road.....	7,347.19
FROM POINT ON BEAR VALLEY ROAD 3 MILES NORTHWEST OF COXEY'S RANCH, VIA DEEP CREEK DRAINAGE TO NORTHEAST CORNER SEC. 12, T. 3 N., R. 4 W.	
Coxey's ranch, 0.3 mile northwest of, 8 feet left of road; cross on embedded stone with ring of rocks roundabout.....	5,732.64
Coxey's ranch, about 2 miles west of, on flat triangular-shaped granite boulder 20 feet north of trail.....	5,196.66
Coxey's ranch, 3½ miles west of, where trail down Coxey Creek turns south toward Little Bear Valley; ground at creek crossing.....	4,704.0
Coxey's ranch, 5½ miles west of, at foot of rocky gorge in which the side drainage next north of Coxey Creek abruptly terminates; bed of Deep Creek	3,849.0
Deep Creek, sheep camp on; on nail in foot of cottonwood tree.....	3,681.50
Deep Creek, at Hot Springs; on nail in foot of cottonwood tree.....	3,506.01
Deep Creek, Hesperia Land and Water Company's diversion dam in, on surface of top of cement work.....	3,366.14
Hesperia Land and Water Company's ditch camp, 800 feet southeast of, at forks of wagon road, on embedded boulder.....	3,053.73
HESPERIA, VIA SHEEP CREEK ROAD, TO TAMBORINO RANCH.	
Hesperia, 2½ miles west of, at junction with road running north and south along west boundary of Hesperia Land and Water Company's tract of land, on top of stake common to corner of secs. 18, 19, 13, and 24, T. 4 N., Ranges 4 and 5 W.	3,377.94
Hesperia, 3½ miles west of, at junction with road running north and south, at corner common to secs. 13, 14, 23, and 24, T. 4 N., R. 5 W.; cross cut on root of juniper tree	3,455.61
Hesperia, 5 miles west of, at junction with road from Oro Grande to San Bernardino, via Cajon Pass; iron post, marked "3522 S. B.".....	3,521.720
Hesperia, 5.6 miles west of, on wooden plug at foot of post common to corner of secs. 15, 16, 21, and 22, T. 4 N., R. 5 W., on south side of road.....	3,580.87
Hesperia, 6½ miles west of, on east edge of third arroyo; on wooden plug 200 feet north of where road reaches east brow of hill.....	3,609.28
Hesperia, 10 miles west of, at southeast corner of Tamborino ranch, on south side of Sheep Creek road, 30 feet southeast of corner common to secs. 13, 14, 23, and 24, T. 4 N., R. 6 W.; iron post, marked "3740 S. B."...	3,739.627
TAMBORINO, VIA NORTH BRANCH OF SHEEP CREEK ROAD, WOOD ROAD, ORO GRANDE ROAD, ETC., TOWARD VICTOR.	
Victor, 9 miles southwest of, where road crosses arroyo; bottom of drainage.....	3,317.0
Victor, 5½ miles southwest of, at point where Oro Grande and San Bernardino road crosses road from Victor to Sheep Creek; iron post, marked "3063 S. B."	3,062.994
Victor, 1½ miles southwest of, at point where road branches to west from main Victor road to San Bernardino, on south side of road coming in from Sheep Creek; peg driven nearly flush with ground	2,932.39
Victor, south end of veranda of Turner Hotel; cross chiseled on west end of top stone step.....	2,716.13
POINT 2 MILES SOUTH FROM VICTOR, VIA DEADMAN'S POINT AND RABBIT SPRINGS ROADS, TO POINT ON HESPERIA AND BEAR VALLEY ROAD, 2½ MILES NORTH FROM ROCK SPRINGS.	
Cole & Harris's Victor ranch, point where main ranch road crosses running stream of water, about ¼ mile east of railroad, on top of brush and earth culvert	2,750.0

	Feet.
Mojave River, at a point $\frac{1}{4}$ mile north of old ranch buildings on Cole & Harris's Victor ranch; surface of water	2,758.0
Victor, $5\frac{1}{2}$ miles southeast from, on Rocksprings and Old Telephone Line roads, 6 feet right of latter road, on brow of second bench land; iron post, marked "2960 S. B."	2,959.360
Fair Plains, lone unoccupied house 2 miles west of Deadman's Point, on head of nail driven in doorsill of front door	2,962.79
Deadman's Point, 12 miles from Victor, on highest point of big round embedded granite boulder 40 feet south of road	3,024.16
15 Mile Point, $\frac{1}{4}$ mile east of where road from Victor joins old stage road from San Bernardino to Rabbit Springs; iron post, marked "3010 S. B."	3,010.180

HESPERIA, VIA PIPE LINE AND BURCHAM ROADS, TO SUMMIT STATION.

Hesperia, $1\frac{1}{4}$ miles south of, where the Hesperia Land and Water Company's pipe line crosses Southern California Railway; nail in road crossing signpost	3,267.59
Hesperia, 3.65 miles southeast of, 40 feet north of road and 300 feet east of where road turns to northeast from pipe line before crossing second arroyo; nail in blazed yucca tree	3,218.23
Hesperia, $6\frac{1}{4}$ miles southeast of, where road to Hesperia Land and Water Company's ditch camp crosses the Mojave River; bed of channel	2,947.0
Hesperia, 7 miles southeast of, at northeast corner of sec. 12, T. 3 N., R. 4 W.; iron post, marked "2960 S. B."	2,959.781
Deep Creek, opposite mouth of, on summit of ridge; on embedded stone left of road, with ring of stones roundabout	3,092.87
Deep Creek, 2.8 miles south of mouth, spring in Burcham Meadow; cross on large flat-topped granite boulder	3,122.30
Burcham's ranch, on east end of south side rail of large cattle scales; cross cut on iron plate	3,181.24
Burcham's ranch, $2\frac{1}{4}$ miles west of buildings at north gatepost of westernmost fence; nail in foot of	3,301.23
Summit station, 3 miles east of; on nail in gatepost on premises of T. F. Read	3,405.26
Summit station, on plank of road crossing	3,822.8

BURCHAM'S RANCH, VIA WEST FORK OF MOJAVE AND CLEGHORN CANYON, TO COST DELL ROAD STATION.

West Fork Mojave River, at first crossing of, with road up canyon; bed of channel	3,155.0
West Fork Mojave River, 200 feet beyond third crossing of; nail in butt of large sycamore tree west side of road	3,196.92
West Fork Mojave River, 150 feet beyond eighth crossing of, in front of barn on Wixum's ranch; cross on embedded stone at foot of fence post	3,305.06
Townships 2 and 3 N., R. 4 and 5 W., 400 feet south of corner common to, on left side of road by gate in west fence of Wixum's ranch on West Fork of Mojave River; iron post, marked "3355 S. B."	3,354.666
West Fork Mojave River, at north end of Reeves's ranch, at summit of natural ridge; cross on embedded rock on east side of trail crossing	3,933.20
Reeves's ranch, 200 feet south of buildings; nail in foot of large hemlock stump	3,999.73
Cleghorn Pass, summit of; on wooden hub driven flush with ground on east side of road	4,537.26
Cleghorn Canyon, at point where road down is crossed by main drainage in bottom of ravine; on top of large round boulder on west side of road	4,085.42
Cleghorn Canyon, log cabin on south side of road; nail in butt of sycamore tree	3,403.62

TRIANGULATION AND SPIRIT LEVELING.

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INTERSECTION OF HESPERIA AND SHEEP CREEK ROAD WITH SAN BERNARDINO AND VICTOR ROAD, VIA LATTER, TO SUMMIT OF CAJON PASS.

	Feet.
Hesperia, 4 miles west of, where road to Sheep Creek crosses Victor road to San Bernardino; on rock in square pit 3 feet deep	3,485.79
Cajon Pass, 5½ miles north of, on edge of west bank of arroyo opposite old cabin; nail in yucca tree east side of road.....	3,574.92
Cajon Pass, 3 miles north of, at point where Oro Grande road branches off to northwest; nail in foot of juniper tree west side of road	3,796.92
Cajon Pass, summit of, where road begins to drop down toward Cajon Station; on embedded stone west side of road with ring of rocks round-about	4,118.77

IDAHO.

KOOTENAI COUNTY.

SAND POINT QUADRANGLE.

The elevations in the following list were based primarily on an iron post at Priest River station on Great Northern Railway, the elevation of which was taken to be 2,076.959 feet, from the Great Northern Railway profiles, and all bench marks are stamped P. R. to indicate reference to this datum. After the work had been completed a connection was obtained with a line of precise levels hereinbefore referred to running from sea level at Tacoma eastward to Missoula, and it was found that the elevations as determined and marked on the ground should be affected by a correction of + 5.421 feet. The elevations given below are reduced to the proper sea-level connection.

The leveling was done by Mr. W. R. Prowell, under the direction of Mr. D. C. Harrison, topographer.

PRIEST RIVER, ALONG GREAT NORTHERN RAILWAY, TO CAREYS FERRY.

	Feet.
Priest River, about ¼ mile east of; on bolt end on south side and east end of approach to railroad bridge	2,076.972
Careys Ferry Landing, ½ miles east of Priest River; on pine tree 12 inches in diameter on north side of Pend Oreille River	2,065.352
Carney's ranch; on top of nail driven in corner gatepost on south side of river.....	2,071.019

CAREYS FERRY, VIA WAGON ROAD, TO MELDER LAKE.

Hoodoo Schoolhouse, on west side of road opposite, 5 miles southeast of Careys Ferry; on pine tree 24 inches in diameter on west side of wagon road.....	2,207.605
Vogler's house, at north gatepost 100 feet from house; iron post, marked "2:22 P. R.".....	2,227.606
Rathdrum and Albane Falls, between forks of roads leading to; on fir stump 18 inches in diameter.....	2,213.889
Rathdrum and Albane Falls, road forks, 1½ miles from; on black pine tree 18 inches in diameter on south side of road.....	2,324.191
Uninhabited ranch, ¼ mile west of; on black pine tree 16 inches in diameter on north side of road.....	2,305.196
Spring Valley, on south side of road near Sullivan's ranch; on large, yellow pine tree 40 inches in diameter.....	2,297.942

	Feet.
Secs. 24 and 19, T. 54 N., R. 4 and 5 W., at $\frac{1}{4}$ section corner between and 900 feet south of road; iron post, marked "2286 P. R."	2, 291.022
Melder's fish ranch, at lower end of; on yellow pine tree	2, 265.918
Melder's Lake, opposite, on south side of road; on pine stump 36 inches in diameter	2, 280.674

MELDER'S LAKE, ALONG WAGON ROAD, TO NEWPORT.

T. 54 N., R. 5 and 6 W., and T. 55 N., R. 5 and 6 W., corner of; iron post, marked "2326 P. R."	2, 331.834
Quinn's ranch, at northwest corner of, on east side of road; on fir tree 30 inches in diameter	2, 298.541
Newport, about 1,200 feet from Great Northern station, on north side of railroad track; spike driven on Idaho side of Washington-Idaho State line post	2, 124.429

NEWPORT, ALONG GREAT NORTHERN RAILWAY, TO PRIEST RIVER.

Washington-Idaho State line, at corner secs. 24 and 25, T. 56 N., R. 6 W.; iron post, marked "2128 P. R."	2, 133.253
Albane Falls, 2.1 miles east of Newport; on east side and north end of south bridge across falls	2, 083.111
Trestle No. 248, 4 miles east of Newport; on next to end bolthead on east side of railroad track	2, 076.864
Trestle No. 246; on bolthead on river side and east end of	2, 077.997

PRIEST RIVER, ALONG WAGON ROAD UP WEST BRANCH.

Saddler's house, opposite, on north side of road; on tamarack tree 40 inches in diameter	2, 165.037
Pine Creek, crossing of; surface of ground	2, 348.634
Terrell's Falls, at east end of bridge across West Branch of Priest River, just below falls and about 600 feet east of Terrell's house in sec. 16, T. 57 N., R. 5 W., just west of line between sections 15 and 16; iron post, marked "2289 P. R."	2, 294.812
Second stream north of Terrell's Falls; surface of ground at	2, 365.0
Moor's meadow, at lower end of, on right of road; tack in stump 60 feet from bridge	2, 420.4
S. H. Moor's ranch, at lower end of, at the west side and north end of bridge across small stream in the southwest $\frac{1}{4}$ of sec. 27, T. 58 N., R. 5 W., and about 400 feet from corner of section; iron post, marked "2411 P. R." ..	2, 416.219

PRIEST RIVER BRIDGE, ALONG GREAT NORTHERN RAILWAY, TO COLBURN.

Bridge No. 241	2, 073.995
Bridge No. 240	2, 076.021
Trestle No. 339, west end of; on bolt	2, 084.655
Careys Ferry, on point of large rock at	2, 071.312
Priest River, $4\frac{1}{4}$ miles east of; on top of stump at left of railway track ..	2, 078.408
Riley's ranch, $\frac{1}{4}$ mile west of; on large rock to west of track	2, 075.235
Bridge No. 237, near center of; on bolthead on south side	2, 093.135
Bridge No. 236, on west end and south side of; on bolt end	2, 100.232
Markham post-office, 60 feet from front door, inside of yard, in the south-east corner of sec. 20, T. 56 N., R. 3 W.; iron post, marked "2088 P. R." ..	2, 093.639
Trestle No. 235, on east side of; on bolthead	2, 082.782
Trestle No. 234, on bolthead third from northeast corner	2, 074.661
Trestle No. 233, on northeast corner of; on bolthead	2, 072.931
Trestle No. 232, northeast corner of; on bolthead	2, 074.575
Trestle No. 231, east end of; on bolthead second from north side	2, 075.628

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
C. Carr's front yard, in center of; 100 feet from house, in southwest $\frac{1}{4}$ of sec. 26, T. 57 N., R. 3 W.; iron post, marked "2087 P. R."	2,092.018
Bridge No. 230, west end and south side of; on bolthead.....	2,073.727
Trestle No. 229, on south side and about center of; on bolthead	2,102.303
Bridge 228, on south side of; on bolthead.....	2,106.304
Sand Point switch; west end of	2,116.319
Sand Point, 32 feet east from northeast corner of section house in sec. 21, T. 57 N., R. 2 W.; iron post, marked "2112 P. R.".....	2,118.152
Trestle No. 227, on south side of; on bolthead third from west end of.	2,144.479
Trestle No. 226, on south side of; on bolthead fourth from west end.....	2,153.159
Bridge No. 225, on south side and center of	2,150.365
Trestle No. 224, on south side and west end of; on bolthead second from end.....	2,152.113
Bridge No. 222, on south side and east end of; on bolthead.....	2,153.018
Bridge No. 221, on south side and east end of; on next to end bolthead..	2,155.382
Colburn, opposite section house and at east end of siding; on stone at right of track	2,175.960

COLBURN, ALONG GREAT NORTHERN RAILWAY, TO POINT TWO MILES EAST OF ELMIRA SIDING.

Colburn, $1\frac{1}{2}$ miles east of section house at corner of T. 58 and 59 N., R. 1 and 2 W., and 1,700 feet northwest of railway track; iron post, marked "2127 P. R."	2,132.383
Pack River bridge, on south side of; on bolthead fourth from east end ...	2,129.406
Trestle No. 219, northeast corner of; on bolthead.....	2,149.717
Elmira siding, 200 feet west of railway track; iron spike in crossing post.	2,149.675

ELMIRA SIDING TO TOWNSHIP CORNER 59 AND 60 N., R. 1 AND 2 W

Elmira, $1\frac{1}{2}$ miles northwest of; on stub at base of small tamarack tree 25 feet from corner of secs. 4, 5, 8, and 9, T. 59 N., R. 1 W.....	2,254.000
T. 59 and 60 N., R. 1 and 2 W., at corner of, $3\frac{1}{4}$ miles northwest of Elmira; aluminum tablet, marked "4131 P. R.".....	4,136.749

COOLIN TO TOWNSHIP CORNER 59 AND 60 N., R. 4 AND 5 W.

Coolin, northwest of northwest corner of fence, 15 yards from edge of lake; iron post, marked "2142"	2,147.049
Priest Lake, water surface west side of; September 1, 1898.....	2,439.421
T. 59 and 60 N., R. 4 and 5 W., $2\frac{1}{4}$ miles northwest of Coolin; aluminum tablet in rock, marked "2760"	2,765.801

COOLIN TO CORNER OF TOWNSHIPS 59 AND 60 N., R. 3 AND 4 W.

Soldier Creek, surface of ground at crossing of.....	2,480.348
T. 59 and 60 N., R. 3 and 4 W., corner of, $3\frac{1}{4}$ miles northeast of Coolin in rock; aluminum tablet, marked "3852 P. R."	3,857.663

FROM PRIEST LAKE ROAD TO SOUTHWEST CORNER OF T. 58 N. AND 3 W.

T. 57 and 58 N., R. 4 W., on division line between, 5 yards west of Priest River and Priest Lake road; iron post, marked "2405"	2,410.721
Township corner, southwest of T. 58 N., R. 3 W., in rock at; aluminum tablet, marked "3491 P. R.".....	3,496.572
T. corner 56 and 57 N., R. 1 and 2 W., $5\frac{1}{4}$ miles from Sand Point and 1.85 miles east of Northern Pacific Railway track; iron post, marked "3376 P. R.".....	3,381.782

	Feet.
T. corner 54 and 55, R. 2 and 3 W., 16½ miles from Sand Point, and 0.6 mile east of Northern Pacific Railway track; iron post, marked "2289".....	2,294.027
Secs. 32 and 33, R. 3 W., T. 54 N., and secs. 4 and 5, R. 3 W., T. 53 N., corner of, 25 miles from Sand Point, and 0.81 mile east of Northern Pacific Railway track; iron post, marked "2354"	2,359.140

OREGON.

ASTORIA, VIA PORTLAND, UP COLUMBIA RIVER, ALONG TRACKS OF
ASTORIA AND COLUMBIA RIVER RAILROAD, NORTHERN PACIFIC
RAILWAY, AND OREGON RAILROAD AND NAVIGATION COMPANY.

The elevations in the following list are based on mean sea level at Astoria, the connection having been made through three bench marks established by the United States Coast and Geodetic Survey.

The leveling was done by Mr. J. H. Carlock, duplicate rods being used.

The elevations published in connection with the Portland quadrangle (Report 1896-97) should be affected by a correction + 1.98 feet.

ALONG ASTORIA AND COLUMBIA RIVER RAILROAD.

	Feet.
Milepost 96, on rail opposite.....	8.0
John Day, 200 feet southwest of station, west end of bridge over John Day River and 150 feet north of residence of Mr. Keefe; iron post, marked "22 A.".....	21.579
John Day River, center of drawbridge over.....	12.0
Milepost 95, on rail opposite.....	10.0
Milepost 94, spike in telegraph pole.....	10.57
Milepost 93, spike in	9.23
Milepost 92, spike in	10.12
Milepost 91, spike in second telegraph pole east of	5.36
Svensen, on rail in front of depot.....	9.0
Svensen, 85 feet south of station and post-office, 5 feet west of road bearing north and south; iron post, marked "8 A."	8.499
Milepost 90, spike in	9.23
Milepost 89, spike in first telegraph pole east of.....	7.60
Milepost 88, spike in	5.52
Knappa, west end of switch at station	7.0
Knappa, 130 feet north of station, 50 feet west of road bearing north and south, and 300 feet south of Knappa Hotel; iron post, marked "9 A"...	8.729
Milepost 86; spike in.....	6.84
Milepost 84; spike in	5.91
Milepost 83; spike in.....	7.94
Aldrigos Point, 5 miles east of Knappa, 40 feet north of track, 600 feet east of flag station, 200 feet north of house on hill, and 300 feet west of milepost 82; iron post, marked "10 A"	9.740
Milepost 81; spike in	8.61
Milepost 80; spike in	11.74
Clifton, 80 feet northeast of station, 70 feet north of track, 80 feet south of water's edge in river; iron post, marked "8 A"	8.419
Milepost 77, 200 feet east of, 10 feet south of track; chisel point on stone 30 by 24 by 20 inches.....	11.05

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Milepost 76; on rail opposite.....	10.0
Westport and Clifton, about midway between, 100 feet south of house, 9 telegraph poles east of milepost 76, 5 telegraph poles west of bridge, 40 feet south of track; iron post, marked "12 A"	12.087
Milepost 75; on rail opposite.....	7.09
Milepost 73; spike in	7.08
Milepost 72; spike in	6.05
Westport, 200 feet southwest of station, 70 feet south of track, 40 feet east of water's edge in Plympton Creek, and 60 feet west of road; iron post, marked "20 A"	20.168
Westport; rail in front of station	20.0
Milepost 71; spike in	11.55
Milepost 70; spike in	8.02
Milepost 69; spike in	7.55
Milepost 68; spike in first telegraph pole west of	11.69
Marshland, 75 feet southwest of station, 40 feet south of track, and 8 feet west of road; iron post, marked "15 A"	15.092
Marshland; on rail in front of station	14.0
Milepost 65; spike in	7.93
Milepost 64; spike in first telegraph pole east of	9.98
Clatskanie; on rail in front of station	16.0
Clatskanie, 200 feet east of station, 75 feet south of railroad, and 20 feet south of public road; iron post, marked "23 A"	22.638
Milepost 61, 95 feet east of, 20 feet south of track; spike in stump.....	12.38
Quincy, on rail in front of station	17.0
Quincy, 40 feet southeast of point for station, 400 feet south of house, 60 feet south of track; iron post, marked "18 A"	18.415
Milepost 58, spike in second telegraph pole north of	13.80
Milepost 57, spike in	10.44
Mayger, 250 feet southwest of station, 200 feet south of track, 220 feet north of Mayger residence; iron post, marked "18 A"	17.953
Mayger, on rail in front of station	18.0
Milepost 55, spike in	18.21
Milepost 54, spike in	20.20
Pyramid, on rail in front of station	19.0
Milepost 53, spike in eighth telegraph pole east of	19.55
Rinearson's Slough, 150 feet south of bridge over, 40 feet southeast of water's edge and 80 feet northwest of residence of Mr. Smith; iron post, marked "9 A"	9.163
Milepost 50, spike in	14.16
Milepost 49, spike in third telegraph pole east of	16.16
Milepost 48, spike in	14.15
Milepost 46, spike in	18.0
Rainier, 200 feet east of post-office, 200 feet southeast of Smith's hotel, 40 feet east of house, 100 feet south of railroad; iron post, marked "26 A"	26.016
Milepost 43, spike in first telegraph pole east of	27.24
Milepost 42, spike in second telegraph pole east of	19.91
Milepost 41, spike in	17.78
Milepost 40, spike in	22.96
Goble, 1,100 feet southwest of station, 300 feet northeast of G. S. Foster's house, 10 feet west of public road, 70 feet south of railroad, at junction of Astoria and Columbia River Railroad and Northern Pacific Railway; iron post, marked "29"	29.165

ALONG NORTHERN PACIFIC RAILWAY.

	Feet.
Goble, in front of station	27.0
Goble, 1 mile from. Spike in second telegraph pole southeast of milepost.	16.49
Milepost 37, spike in	23.36
Milepost 36, spike in	25.55
Milepost 35, spike in	28.80
Milepost 34, spike in	38.69
Deer Island, on rail in front of station	49.0
Deer Island, 130 feet southwest of station, 100 feet southeast of post-office, 100 feet west of track; iron post, marked "51 A"	50.818
Milepost 33, spike in	60.71
Milepost 32, spike in	72.15
Columbia, 60 feet north of station, 40 feet southwest of public road, 80 feet northeast of track. Iron post marked "78 A"	77.595
Columbia, on rail in front of station	80.0
Milepost 30, spike in	91.22
Milepost 29, spike in	113.61
Houtton, on rail in front of station	103.0
Houtton, 210 feet south of station, 40 feet east of post-office, 60 feet west of railroad, 100 feet south of wagon road; iron post, marked "99 A"	98.700
Milepost 27, spike in	78.62
Milepost 26, spike in	51.80
Warren, on rail in front of station	48.0
Warren, 70 feet northeast of station, 60 feet east of railroad, 10 feet north of public road, 100 feet northwest of post-office; iron post, marked "48 A".	48.407
Milepost 24, spike in	47.33
Milepost 23, 40 feet west of; spike in root of tree 40 inches in diameter...	53.66
Milepost 22, spike in first telegraph pole south of ..	43.59
Scappoose, 100 feet east of station, 90 feet northeast of track, 20 feet south of public road, 300 feet northeast of post-office; iron post, marked "61 A".	60.727
Milepost 19, spike in first telegraph pole south of	37.01
Milepost 18, spike in	34.51
Milepost 17, spike in	32.29
Milepost 16, spike in	32.04
Milepost 15, spike in	32.01
Milepost 14, spike in	31.24
Holbrook, 200 feet northwest of platform in place for station, 230 feet east of store and house, 100 feet east of road, 120 feet west of railroad track; iron post, marked "35 A"	34.899
Milepost 12, spike in	32.30
Milepost 11, spike in	30.47
Milepost 10, spike in	31.49
Milepost 9, spike in	32.44
Linnton, 210 feet east of station, 300 feet east of post-office, 55 feet east of railroad track, 10 feet south of road; iron post, marked "40 A"	40.330
Milepost 7, spike in	31.82
Milepost 6, spike in	34.76
Milepost 5, spike in	43.12
Milepost 4, spike in	31.77
Milepost 3, spike in	29.86
Milepost 2, spike in	31.45
Portland, rail in front of station	29.26
Portland, near Hoyt street, 100 feet west of railroad crossing; spike in telegraph pole	29.06

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Portland, 100 feet from center of post-office, on south side of yard, 40 feet from east and west street and near latitude pier; iron post, marked "51 A"	51.016

ALONG OREGON RAILROAD AND NAVIGATION COMPANY'S TRACK.

Portland, in top of stone pier at south side of east end of steel bridge across Willamette River; copper bolt, marked "29"	30.947
Willamette River, water's edge on December 30, 1898, 4 p.m.	5.0
East Portland, in front of depot	31.0
Milepost 4, 60 feet northeast of, tack point in post 10 feet northeast of track	86.15
Portland Center, 55 feet south of track, 30 feet east of road, 10 feet north of road and 200 feet east of house; iron post, marked "183 A"	183.100
Milepost 8, spike in third telegraph pole east of	221.53
Milepost 9, spike in	220.77
Clarnie, 250 feet northwest of platform for station, 150 feet east of "Bunk House," 60 feet north of track, 90 feet west of section house; iron post, marked "205 A"	204.715
Clarnie, on rail in front of station	212.0
Milepost 11, 60 feet southwest of; spike in stump 50 inches in diameter...	201.39
Milepost 12, spike in	183.53
Milepost 14, 60 feet southeast of; spike in stump in line with telegraph poles	143.31
Fairview, on rail in front of station	114.0
Fairview, 70 feet west of hotel, 140 feet east of Cleone post-office, 110 feet south of track, and 50 feet south of wagon road; iron post, marked "114 A"	113.580
Milepost 16, spike in	97.94
Milepost 17, spike in	72.20
Troutdale, 100 feet northeast of depot, 40 feet north of switch leading to "Union Meat Company's" establishment, 223 feet north of main track, in edge of field belonging to D. F. Buckridge; iron post, marked "41 A" ..	41.382
Sandy River, center of bridge over	47.0
Sandy River, water's edge	22.0
Milepost 19, spike in	40.84
Milepost 20, spike in	41.49
Milepost 21, spike in	46.04
Milepost 22, spike in	42.29
Corbett, 30 feet west of post-office, 25 feet south of road and on line with post-office, 60 feet south of track; iron post, marked "46 A"	45.601
Milepost 23, spike in	42.07
Milepost 24, spike in	42.69
Milepost 25, spike in	42.43
Lataurelle, on rail in front of station	44.2
Lataurelle, 50 feet south of station, 100 feet south of track, 50 feet north of road, 80 feet north of post-office, 10 feet east of sidewalk, and 25 feet east of road; iron post, marked "57 A"	57.397
Milepost 27, spike in	42.15
Milepost 28, spike in	40.69
Bridalveil, on rail in front of station	40.33
Bridalveil, 80 feet south of track, 40 feet south of public road, 30 feet northeast of A. H. Willett's residence, and in yard of same; iron post, marked "56 A"	55.606

* The above is a bench mark established in 1896 in connection with survey of Portland quadrangle. Elevation 28.94, based on an assumed height in Portland.

	Feet.
Milepost 29, spike in	43.60
Milepost 30, spike in	41.95
Milepost 31, spike in	43.42
Multnomah Falls, 320 feet north of base of, 70 feet south of railroad, 100 feet west of creek, 80 feet east of an abandoned house; iron post, marked "46 A"	45.839
Milepost 33, spike in	43.18
Oneonta siding, in front of platform at	42.5
Milepost 34, spike in	43.37
Horseshoe Falls, on rail opposite	44.87
Milepost 35, spike in	60.0
Milepost 36, spike in	78.14
Milepost 37, spike in, at Dodson's switch	77.48
Warrendale, 150 feet south of post-office, 50 feet south of track, 8 feet south of road, 90 feet southwest of platform for station; iron post, marked "77 A"	76.965
Milepost 39, spike in	75.44
Milepost 40, spike in	68.34
Bonneville, in front of station	50.3
Bonneville, 75 feet southeast of station, 200 feet northwest of dancing pavilion in park, 250 feet south of hotel, and 130 feet south of railroad track; iron post, marked "53 A"	52.616
Milepost 42, spike in	55.35
Milepost 43, spike in	73.99
Milepost 44, spike in	97.33
Cascade Locks, 330 feet northeast of post-office, 400 feet northwest of station, 80 feet south of engineers' office on Government reserve, 50 feet north of railroad track; iron post, marked "99 A"	98.553
Milepost 46, spike in	107.91
Milepost 47, spike in	124.77
Milepost 48, spike in	99.14
Milepost 49, spike in	92.22
Milepost 50, spike in	92.46
Milepost 51, spike in	92.96
Wyeth, 40 feet east of Bunk House, 49 feet west of section house, 40 feet south of road, 90 feet south of track; iron post, marked "97 A"	96.816
Milepost 53, spike in	92.52
Milepost 54, spike in	93.17
Milepost 55, spike in	92.89
Milepost 56, spike in	102.63
Milepost 57, spike in	120.25
Viento, on rail in front of	102.4
Viento, 70 feet northeast of station, 30 feet southwest of store and post-office, 20 feet north of switch, 80 feet north of railroad; iron post, marked "103 A"	102.874
Milepost 59, spike in	99.76
Milepost 61, spike in	104.43
Milepost 62, spike in	105.99
Milepost 63, spike in	115.86
Milepost 64, spike in	94.99
Milepost 65, spike in	96.85
Hood River, on rail in front of station	99.67
Hood River, 45 feet southeast of southeast corner of station, 130 feet north of hotel, 65 feet south of railroad, 30 feet west of wagon road; iron post, marked "103 A"	103.125

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Milepost 67, spike in.....	95.22
Milepost 68, spike in.....	95.34
Milepost 69, spike in.....	96.57
Milepost 71, spike in.....	96.23
Mosier, 100 feet southeast of station, 100 feet north of A. Stewart's store, 60 feet west of wagon road, 80 feet south of track; iron post, marked "105 A".....	105.047
Milepost 73, spike in.....	95.78
Milepost 74, spike in.....	97.21
Milepost 75, spike in.....	102.42
Milepost 76, spike in.....	109.87
Milepost 77, spike in.....	97.22
Milepost 78, spike in.....	100.80
Milepost 79, spike in.....	127.23
Rowena, 200 feet southeast of station, 20 feet northeast of section house, 100 feet south of track; iron post, marked "146 A".....	146.539
Milepost 81, spike in.....	179.44
Milepost 82, spike in.....	172.61
Milepost 83, 300 feet east of, 55 feet south of track at switch head, 15 feet east of public road; iron post, marked "202 A".....	202.043
Milepost 84, spike in.....	187.58
Milepost 86, spike in.....	138.62
Milepost 87, spike in.....	117.12
The Dalles, 20 feet from southeast corner of Wasco County court-house building, 75 feet north of center of Third street and 75 feet west of center of Union street; iron post, marked "103 A".....	102.924
The Dalles, on rail in front of Umatilla House.....	96.2
Milepost 89, spike in.....	97.87
Milepost 90, spike in.....	99.86
Milepost 91, spike in.....	132.55
Senferts switch, west end connection of.....	133.5
Switch leading to cannery, west end connection of.....	124.1
Milepost 93, spike in.....	132.49
Milepost 94, spike in.....	146.36
Summit switch, 50 feet west of station house, 290 feet northwest of sta- tion post, 55 feet north of track and close to bank descending to Colum- bia River; iron post, marked "187 A".....	187.356
Milepost 97, spike in.....	161.93
Milepost 98, spike in.....	150.34
Milepost 99, spike in.....	162.56
Celilo, 120 feet west of station, 60 feet south of post-office in cannery building, 200 feet east of Taffe's house, 25 feet north of track; iron post, marked "159 A".....	158.823
Celilo, in front of station on rail.....	158.05
Milepost 101, spike in.....	155.84
Milepost 102, spike in.....	159.40
Milepost 103, spike in.....	162.95
Deschutes River, west end of bridge over.....	164.3
Deschutes River, water's edge.....	138.3
Deschutes, 80 feet southeast of station board, 80 feet northwest of hotel, 100 feet south of railroad track, 40 feet north of road; iron post, marked "186 A".....	166.212
Milepost 105, spike in.....	164.91
Milepost 107, spike in.....	166.14

	Feet.
Biggs, 80 feet east of Henderson Hotel, 150 feet southeast of post-office, 100 feet south of Oregon Railroad and Navigation Company's track, 100 feet north and 40 feet east of point of "Y" on Columbia Southern Railway; iron post, marked "177 A."	176.954
Milepost 109, spike in	169.11
Milepost 110, spike in	170.43
Grants, 270 feet southwest of station, 50 feet east of Wilson Hotel, 50 feet west of livery stable, 180 feet west of post-office, 260 feet south of railroad track; iron post, marked "171 A."	170.693
Grants, in front of station	174.3
Milepost 112, spike in	170.59
Rufus, 150 feet southwest of station, 250 feet southeast of wheat elevator, 50 feet from southeast corner of Union Warehouse, and about 700 feet north of post-office, 130 feet south of railroad; iron post, marked "179 A."	178.628
Milepost 115, spike in	185.79
Milepost 116, spike in	179.86
Milepost 117, spike in	180.21
John Day, 60 feet north of railroad track, 30 feet northeast of section house, 200 feet west of Bunk House, and about 1,000 feet west of west end of bridge over John Day River; iron post, marked "191 A."	190.784
John Day River, water's edge	152.7
Milepost 119, spike in	185.06
Milepost 120, spike in	187.75
Milepost 121, spike in	187.67
Squally Hook, 80 feet northwest of point for station, 260 feet northwest of milepost 123, 40 feet north of main track, 100 feet northeast of east end connection of switch; iron post, marked "131 A."	192.682
Milepost 124, spike in	195.79
Bridge No. 197, center of, on rail	222.1
Milepost 126, spike in	221.02
Quinns, 30 feet northwest of station board, 500 feet northeast of milepost 127, $\frac{1}{2}$ mile west of section house, 40 feet north of track; iron post, marked "226 A."	226.421
Milepost 128, spike in	225.73
Milepost 130, spike in	206.63
Milepost 131, spike in	201.79
Milepost 132, spike in	204.46
Blalocks, in front of, on rail	217.3
Blalocks, 140 feet southeast of station, 170 feet south of railroad, 180 feet southwest of water tank, 30 feet northeast of Hotel Bates; iron post, marked "214 A."	214.003
Milepost 135, spike in	206.96
Milepost 136, spike in	210.93
Milepost 137, spike in	209.62
Milepost 138, spike in	213.93
Milepost 139, spike in	213.74
Milepost 140, spike in first telegraph pole west of	224.44
Arlington, rail in front of station	224.0
Arlington, 80 feet east of station, 30 feet south of main track, 40 feet north of switch, 50 feet west of tool house, 50 feet northwest of warehouse No. 1, and 400 feet west of section house; iron post, marked "225 A."	224.786
Milepost 143, spike in	218.63
Milepost 144, spike in	217.38

	Feet.
Milepost 145, spike in	219.89
Arlington, 4 miles east of, 30 feet east of fourth telegraph pole west of milepost 146, 100 feet south of railroad track, 20 feet south of granite boulder; iron post, marked "225 A."	224.654

CURRY COUNTY.

PORT ORFORD QUADRANGLE.

The elevations in this list are based on a bronze tablet in the north wall of Hermann & Brown's brick building, corner of Spruce and Front streets, 30 feet from northwest corner of building and 2 feet above the surface of ground in Myrtle Point, Coos County, Oregon, the height of which is accepted as 75.916 feet above mean sea level. This elevation was obtained from levels carried from a bench mark of the United States Coast and Geodetic Survey at Empire City the previous field season. (See Eighteenth Annual Report, Part I, p. 400.)

The leveling was done under the general direction of Mr. A. E. Murlin, topographer, by Mr. O. C. Ward, levelman.

SIXS RIVER BRIDGE, ALONG COUNTY ROAD, TO PORT ORFORD.

Elk River, bridge across; 240 feet south of south approach to, 10 feet right of road at corner of barn; iron post, marked "34 M. P."	34.027
N. B. Neeley's house, in front of; about $1\frac{1}{4}$ miles south of bridge across Elk River, 10 feet west of wagon road, in root of fir stump 4 feet in diameter and 5 feet high	150.38
Silver Butte, 90 feet southwest of base of; in butt of dead fir stub 4 feet in diameter at east edge of wagon road	84.39
Garrison Lagoon, swamp east of; road crossing	18
Port Orford, top of hill at north edge of; about 450 feet north of school- house; in root of fir stump at west edge of road	94.1
Port Orford, in front yard of hotel, in center of lawn; iron post, marked "56 M. P."	56.040

PORT ORFORD, VIA OPHIR POST-OFFICE, TO BAGNELL'S FERRY ACROSS BOGUE RIVER.

Port Orford, 0.84 mile south of, at northeast side of wagon road; in root of cedar stump 5 feet high, $2\frac{1}{4}$ feet in diameter	164.55
Hubbard Creek, surface of water under bridge over	11.0
Hubbard Creek and Brush Creek, summit of road on hill between, on west edge of road in bend; iron post, marked "1113 M. P."	1,113.008
Brush Creek, $\frac{1}{4}$ mile northwest of, at west side of road at junction of Fred Pfisterer's private road; in butt of dead fir tree 3 feet in diameter	450.93
Brush Creek, east fork of, $\frac{1}{4}$ mile south of ford across, about 75 feet south of mouth of small creek from the east, at foot of hill between Brush and Hubbard creeks, at west edge of wagon road; in butt of hemlock tree 5 feet in diameter	123.02
Brush Creek, 60 feet east of, at corner of townships 33 and 34 S., R. 14 and 15 W., at west edge of road; iron post, marked "170 M. P."	170.012
Brush Creek, 60 feet east of, 65 feet south of corner of townships 33 and 34 S., R. 14 and 15, 30 feet west of wagon road; in myrtle stump $2\frac{1}{4}$ feet high and $1\frac{1}{4}$ feet in diameter	170.42
Brush Creek, floor of bridge across	183.0

	Feet.
Mussel Creek, 130 feet north of road crossing; in spruce tree 6 feet in diameter at west side of wagon road	23.09
Mussel Creek, south bank of, 10 feet from west edge of road; iron post, marked "24 M. P."	24.073
Frankport, $\frac{1}{4}$ mile south of junction with road to; in hemlock stump 26 inches in diameter in front of residence at south side of road	348.02
Euchre Creek, $\frac{1}{4}$ mile north of, in southeast angle of junction of main road with road running east; iron post, marked "28 M. P."	27.981
Euchre Creek, floor of bridge across	23.0
Gold Beach, 6 miles north of, at junction with road running southeast to Bagnell's Ferry; in pine tree 12 inches in diameter at west side of road.	106.84
Gold Beach, 6 miles north of, in corner of garden opposite junction with road running southeast to Bagnell's Ferry; iron post, marked "107 M. P."	107.101
Bagnell's Ferry, 0.1 mile west of, in corner of garden; iron post, marked "32 M. P."	31.938
Lobster Creek, opposite mouth of; chisel mark on rock ledge on south bank of Rogue River	19.74
Lobster Creek, opposite mouth of, in ledge of blue slate on south bank of Rogue River; copper bolt, marked "31 M. P."	31.108
Lobster Creek, 1 mile east from mouth of; chisel mark on top of boulder at rock point on south bank of Rogue River	26.0
Quosaten Creek, opposite mouth of, in rock ledge; copper bolt, marked "44 M. P."	43.928
Skookum House Mountain, at west end of bluff and north side of, and at east end of long bar on south side of Rogue River; chisel mark on point of rock ledge	42.07
Wake Up Riley Creek, at mouth of, near top of large boulder; copper bolt, marked "58 M. P."	57.817
Tommy East Rock, on north side of and about 300 feet east from mouth of "Tommy East" Creek, at "Potato Illahe;" chisel mark on seam of white quartz	59.79
Nail Keg Creek, 440 feet west from mouth of, and 5.4 feet above low-water mark, on south bank of Rogue River; chisel mark on rock ledge.	61.94
Painted Rock Creek, top of large rock in mouth of; copper bolt, marked "86 M. P."	85.961
Crooked Rifle, foot of; chisel mark on top of granite boulder 7 by 5 by 4 feet, 15 feet north of large boulder at end of point	83.63
Agness post-office, on north side of Rogue River, 1.3 feet above low-water mark; chisel mark on bed rock	92.55
Illinois River, at junction with Rogue River, at foot of bluff; chisel mark on top of sandstone boulder	100.79
Illinois River, at junction with Rogue River; extreme low-water mark ...	94.0
Illinois River, at junction with Rogue River, in sandstone ledge west of Illinois River and south of Rogue River; copper bolt, marked "113 M. P."	112.895
Snout Creek, 300 feet south of mouth of, on east bank of Rogue River; chisel mark on top of sandstone point, 24 feet from end	109.74
Chasta Costa Creek, 140 feet south of mouth of, on east side of Rogue River; chisel mark on top of conglomerate boulder, 8 feet above low water	118.13
Township line between townships 34 and 35 S., R. 11 W., Willamette meridian, near; chisel mark on top of boulder on west side of river	118.92
Twomile Creek, $\frac{1}{4}$ mile south of mouth of, on west side of Rogue River; chisel mark on sandstone point of bed rock	131.93

TRIANGULATION AND SPIRIT LEVELING.

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	Feet.
Twomile Riffle, head of	131. 0
Foster Creek Riffle, foot of.....	149. 0
Foster Creek, 1,170 feet from its mouth on left bank of, on granite bowlder; copper bolt, marked "179 M. P."	178. 908
Foster Creek, opposite south fork of, in shale bed rock; copper bolt, marked "295 M. P."	295. 004
Little Bear Creek, mouth of; on point of serpentine ledge in midstream.	374. 32
Elk River, west bank of, in large bowlder at mouth of Bald Mountain Creek, north bank; copper bolt, marked "181 M. P."	181. 017
Elk River, crossing of trail from Johnson's ranch, up river; chisel mark on top of rock in midstream	234. 01
Axtell's mining camp, chisel mark on flat point of granite ledge 40 feet east of mouth of small creek from north	245. 28
Panther Creek, 100 feet east of mouth of, on south bank of Elk River, in conglomerate ledge; copper bolt, marked "533 M. P."	533. 369
Blackberry Creek, 275 feet west of mouth of, in top of granite bowlder 25 by 20 by 10 feet in bed of Elk River; copper bolt, marked "778 M. P."	778. 398
Elk River, forks of, 90 feet north of, on east bank of North Fork, in slate ledge; copper bolt, marked "886 M. P."	885. 514
Euchre Creek bridge, $\frac{1}{2}$ mile north of; top of guard post at south side Euchre Creek road and 100 feet east of junction with county road.....	29. 44
Cedar Fork, junction of with Euchre Creek, in northeast angle of forks; iron post, marked "240 M. P."	240. 166

WASHINGTON.

DOUGLAS, OKANOGAN, AND KITTITAS COUNTIES.

WATERVILLE QUADRANGLE.

The elevations in the following list are based on an aluminum tablet, hereinbefore described, in the city hall at Tacoma. The elevations published in the report for last year relating to this locality should be affected by a correction of -30.214. The work of last year was based on an approximate elevation at Chelan Falls, furnished by the United States Engineer Corps, but when the sea-level communication was established the error as above was found to exist. All bench marks stamped with the letter T are referred to Tacoma, and those without letter are based on the old datum at Chelan Falls.

The leveling was done, under the general direction of Mr. R. A. Farmer, topographer, by Mr. Ed. M. Fry, levelman.

KNAPP'S FERRY, ON RIGHT BANK OF COLUMBIA RIVER, ALONG STATE ROAD TO ENTIAT RIVER.

	Feet.
Knapp's Ferry, 35 feet south of warehouse, at south side of granite bowlder; iron post, marked "709 T"	708. 886
J. T. Fisher's house, 200 feet northwest of, 6 miles southwest of Knapp's Ferry, and near steam-ferry landing; iron post, marked "705 T"	704. 992
Ribbon Bluff, top of granite bowlder at foot of south side of.....	738. 6
Entiat River, $\frac{1}{2}$ mile north of; nail in top of milepost 20.....	782. 48
Entiat River road; top of stone at intersection with State road.....	698. 9
Entiat River bridge, 250 feet northwest of, and 150 feet northeast of store on north side of road; iron post, marked "696 T"	696. 307

ENTIAI RIVER, ALONG STATE ROAD, TO WENACHE.

	Feet.
O'Connor's Ferry, 100 feet southwest of ferry derrick; top of granite boulder on west side of road.....	705.8
Milepost 15, nail in top of	673.01
Milepost 12, nail in top of	796.36
Swakane Creek, near mouth of, 10 feet west of State road and 10 feet north of road up Swakane Valley; iron post, marked "696 T".....	695.884
Milepost 7, about $\frac{1}{2}$ mile south of, 1,000 feet northwest of old lime works on west side of State road; iron post, marked "738 T".....	737.5
Wenache River, north end of bridge over.....	648.7
Wenache, 100 feet west of depot and 150 feet east of water tank; iron post, marked "639 T"	638.895
Wenache, Columbia River Bank building, front of, 2 feet above sidewalk and 8 feet north of entrance door; aluminum tablet, marked "669 T" ..	668.999

FROM COLUMBIA RIVER, UP NEVAREE'S COULEE, TO SUMMIT OF RIDGE.

L. E. Claghorn's ranch, 10 feet west of gate to; on top of granite boulder west side of road	1,359.9
Secs. 16 and 21, T. 27 N., R. 21 E., $\frac{1}{4}$ corner; top of stone for.....	1,465.3
Log cabin, 300 yards southwest of, and 40 feet east of road, on a knoll in clump of pine trees at top of ascent on south side of ridge; iron post, marked "1664 T"	1,663.740

UP ENTIAI VALLEY.

State road; top of stone at intersection with road up Entiat River	698.893
Granite boulder 10 feet south of road, on top of; marked "U.S.B.M." ..	819.4
Entiat post-office, 3 miles west of; north end of bridge over Entiat River.	823.3
Entiat post-office, 5 miles west of; bridge over Entiat River	895.8
Gray's house, 200 feet north of, in northeast corner of fence 5 feet west of road, in granite boulder; aluminum bolt, marked "1316 T."	1,316.218
Log house, 100 feet north of, and 100 feet west of crib, east side of trail up Entiat River, in large granite boulder; aluminum bolt, marked "1680."	1,680.424

UP CRUMS CANYON.

J. E. Crum's house, 200 feet northwest of; spike in root of pine tree 24 inches in diameter; tree marked. "U.S.B.M."	1,702.60
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UP SWAKANE CANYON AND DOWN NEHORKUM CANYON TO MISSION.

Divide between Swakane and Nehorkum canyons, 10 feet west of trail on summit of, in granite boulder; aluminum bolt, marked, "3255.".....	3,255.257
Wenache River, water level	757.0
Mission, top of rail in front of station of Great Northern Railway	795.5
Mission, 150 feet southwest of station, 100 feet south of railroad water tank, at corner in center of northwest $\frac{1}{4}$ of Sec. 4, T. 23 N., R. 19 E.; iron post, marked "797 T.".....	796.730

WENACHE TO PESHAISTIN ALONG GREAT NORTHERN RAILWAY.

Milepost 1655, 10 feet southeast of; nail in top of post.....	662.18
Milepost 1660, 10 feet west of; nail in top of post.....	750.12
Milepost 1665, railroad spike in.....	902.37
Peshastin, 100 feet west of railroad track at south end of switch, 30 feet south of small house on south side of wagon road; iron post, stamped "1051."	1,045.422

TRIANGULATION AND SPIRIT LEVELING.

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FROM O'CONNOR'S FERRY, VIA CORBERLY'S, WATERVILLE, AND BUNNS CANYON, TO KNAPP'S FERRY.

	Feet.
O'Connor's Ferry Landing, 400 feet east of, 1 mile southwest of Orondo, on north side of road and east bank of Columbia River; iron post, marked "678 T.".....	678.464
Secs. 29, 30, 31, and 32, T. 25 N., R. 22 E., 42 feet northeast of corner; iron post, marked "2771 T".....	2,771.110
Secs. 19, 20, 29, and 30, T. 25 N., R. 22 E., top of stone set for corner to.....	2,799.23
Waterville, Douglas County court-house, in east wall of brick vault on south side of, 2 feet from ground and 2 feet from southeast corner of vault; aluminum tablet, marked "2617 T.".....	2,616.961
Waterville, Douglas County Bank building, in front wall of, 2 feet from sidewalk and 2 feet north of entrance door; aluminum tablet, marked "2624 T.".....	2,623.687
Waterville Schoolhouse, 4½ miles due north of, on front or south side, 1½ feet from ground and 2 feet from southeast corner of foundation; aluminum tablet, marked "3004 T.".....	3,004.453
Bunns Canyon, at head of, 250 feet northwest of small house, 10 feet from east side of road; iron post, marked "3055 T.".....	3,054.533
Troy post-office, 1,000 feet southwest of, just opposite warehouse at Knapp's Ferry, on left bank of Columbia River; iron post, marked "725 T.".....	724.825

DOBSON'S RANCH, VIA BADGER MOUNTAIN, TO WATERVILLE.

Badger Mountain, at junction of roads on summit of; iron post, marked "4145.".....	4,144.554
Schoolhouse, district No. 3, 150 feet southeast of, on north side of road; iron post, marked "2736 T.".....	2,735.751

SKAGIT AND SNOHOMISH COUNTIES.

SAUK AND STILLAGUAMISH QUADRANGLES.

The elevations in the following list are based on a bench mark of the United States Coast and Geodetic Survey established in connection with local tidal observations at Tulalip Bay, Possession Sound.

The bench mark is on the southeast face of a large flat granite boulder 4 feet square on a rocky point about 275 feet southeast of a clay bluff, on which stands Madrona triangulation station. There are several smaller boulders lying southward and westward of the one on which the bench mark is placed. The point of reference is the intersection of the lines of a cross on the rock which corresponded to 9 feet on the tidal staff. The elevation of the bench mark was determined as 3.465 feet below mean sea level.

The leveling was under the general direction of Mr. L. C. Fletcher, topographer, and was done by Messrs. L. D. Ryus and W. S. Wheeler. Mr. Wheeler carried the line, using duplicate rods from Tulalip to crossing of Seattle and International Railway over Stimson Logging Railroad. He also ran with single rod the line from Arlington via Woodly to the vicinity of Hamilton. The remaining portion of the work was done by Mr. Ryus.

The results of the leveling work executed during the previous field season as published should be affected by a correction of +2.50, this

discrepancy having been determined when a connection was established between the assumed datum as furnished by the railroad profiles at Monte Cristo and the line as based on tidal connection at Tulalip.

TULALIP, VIA MARYSVILLE AND STIMSON LOGGING RAILROAD, TO SEATTLE AND INTERNATIONAL RAILWAY, ABOUT MIDWAY BETWEEN ARLINGTON AND HARTFORD JUNCTION.

	Feet.
Tulalip, Tulalip Bay, north side of entrance, + on southeast face of large flat granite boulder about 275 feet southeast of clayey bluff, on which Madrona Δ stands	-3.465
Tulalip Indian Reservation, 225 feet northwest of northwest corner of fence around agency, 75 feet south of road, in gray granite rock which stands 1 foot out of ground and 125 feet north of corner of picket fence; copper bolt, marked "65 TUL."	64.790
Tulalip, 6 $\frac{1}{4}$ miles east of; nail in 54-inch cedar stump 8 feet high, 15 feet west of fork road and top of hill	25.32
Kwittsehda Creek, floor of bridge over	15.0
Marysville station, 50 feet south of southeast corner of, about 50 feet east of track; iron post, marked "16 T. U. L."	16.047
Marysville, 1 $\frac{1}{4}$ miles north of, nail in 36-inch fir stump 20 feet east of fork roads, 100 feet east of Great Northern Railroad crossing	44.92
Stimson Logging Railroad car shops, road crossing north of; top of rail ..	86.2
Stimson Logging Railroad, under overhead bridge of, at junction with Seattle and International Railway; top of track	137.0
Seattle and International Railway bridge over Stimson Logging Railroad, 500 feet south of; nail in 42-inch cedar stump 4 feet high, 10 feet east of track, 20 feet south of $\frac{1}{4}$ mile board	160.87

STIMSON LOGGING RAILROAD, VIA SEATTLE AND INTERNATIONAL RAILWAY, TO HARTFORD JUNCTION.

Bridge 36, top of rail	181.57
Bridge 35, top of rail	184.46
Bridge 34, top of rail	210.73
Bridge 33, top of rail	231.96
Bridge 32, top of rail	257.93
Bridge 32, road crossing 1 mile south of; top of rail	282.82
Getchell, station; top of rail	335.73
Lake Cassidy, switch to sawmill opposite; top of rail	333.99
Lake Cassidy, road crossing at; top of rail	333.69
Hartford, road crossing; top of rail	272.29

HARTFORD JUNCTION, VIA EVERETT AND MONTE CRISTO RAILWAY, TO GRANITE FALLS.

Hartford Junction, depot; top of rail	233.14
Hartford Junction, junction of Seattle and International Railway and Everett and Monte Cristo Railway switch, top of rail	231.02
Hartford Junction, 25 feet northeast of station, midway between track of Seattle and International Railway and Everett and Monte Cristo Railway; iron post, marked "232 T. U. L."	232.061
Hartford Junction, 2 $\frac{1}{4}$ miles northeast of; nail in 24-inch cedar stump 4 feet high, south side of track, 35 feet northeast of Skidroad crossing, 960 feet northeast of logging spur track to west	237.18

GRANITE FALLS, VIA BARLOW PASS, TO DARRINGTON, AND DOWN STILLAGUAMISH RIVER.
(See published report for preceding year.)

Down Stillaguamish River to Arlington.

N. C. Hollingsworth's house, about $\frac{1}{4}$ mile east of; forks of road	240.74
N. C. Hollingsworth's house, road at gate in front of	226.0
N. C. Hollingsworth's house, about 1 $\frac{1}{4}$ miles west of; floor of bridge at foot of hill	209.32

	Feet.
N. C. Hollingsworth's house, about 1½ miles west of, 40 feet east of junction of old and new roads; nail in root of 24-inch cottonwood tree north side of road	206.60
N. C. Hollingsworth's house, about 2 miles west of; top of hill junction of old and new roads	231.0
Four-mile post, about 300 feet east of, top of hill; nail in 20-inch fir tree north side of road	274.68
Deer Creek bridge, nail at foot of last tie west end north side	193.97
Oso, junction of road to store and main road, 2½ feet north of; nail in 40-inch cedar stump 6 feet high	192.39
Oso, 1½ miles west of, 15 feet east of corduroy bridge; nail in 30-inch hemlock stump 6 feet high south of road	149.67
Dixon's ranch, bridge over small stream and mash, floor at east end	139.65
Stillaguamish River, iron bridge over, north side near center of; nail in plank floor	142.10
Stillaguamish River, ¼ mile west of iron bridge over, 150 feet southeast of road, opposite house, in sandstone ledge projecting from hill; copper bolt, marked "164 T. U. L."	164.269
Oso, 4 miles west of, 150 feet from house; nail in hemlock stump north of road against fence at foot of hill	147.53
Oso, 5 miles west of, 100 feet from Bridge E; nail in root of 9-inch fir tree north of road	107.94
Oso, 6 miles west of, south of road, opposite fork road to north; nail in root of 60-inch charred fir	197.70
Oso, 7¼ miles west of, 50 feet west of skid road, 50 feet southwest of engine house; nail in root of 54-inch cedar stump 4 feet high, north of road	190.09
South Fork Stillaguamish River, bridge over; floor northeast end	99.86
Arlington, Walker Hotel, switch near; top of rail	91.15
Arlington, Haller S. H., 5 feet east and 3 feet north of northwest corner of; iron post, marked "104 ft. T. U. L."	103.986
Arlington, station, top of rail in front of	109.27
<i>Arlington, via Seattle and International Railway, to Stimson Logging Railroad.</i>	
Arlington, about 2 miles south of, road crossing at whistle post; top of rail	148.97
Edgecomb, switch at logging spur north of; top of rail	138.18
Edgecomb, shingle mill 600 feet south of road crossing; top of rail	132.98
Water tank, top of rail in front of	150.65
Stimson Logging Railroad, north end of bridge over; top of rail	151.50
<i>Granite Falls to Canyon Creek.</i>	
Granite Falls, 1 mile northeast of road at curve; nail in 76-inch hollow cedar stump	454.45
Stillaguamish River, south end of bridge over South Fork of; top of floor	359.75
Canyon Creek foot bridge, junction of trail and road	524.10
¼ corner sec. 32, T. 31 N., R. 7 E. and sec. 5, T. 30 N., R. 7 E., 125 feet northeast of, in rock projecting 2½ feet out of hill; copper bolt, marked "545 M. C."	545.433
<i>Junction of Jim Creek road with Arlington and Oso road to northeast corner of T. 31 N., R. 6 E.</i>	
T. 31 N., R. 6 E., northeast corner of; ground	195.2
T. 31 N., R. 6 E., 35 feet south of northeast corner of, south of forks of road; nail in 60-inch cedar tree	196.80
T. 31 N., R. 6 E., 25 feet south of northeast corner of, south of forks of road; iron pipe, marked "196 T. U. L."	196.121

VICINITY OF DARRINGTON TO SAUK CITY.

	Feet.
Darrington, 4 miles north of, east of road, opposite bars; nail in 36-inch cedar tree.....	479.03
Darrington, 5 miles north of; nail in fir tree west of road at top of hill...	455.71
Darrington, 7½ miles north of, 200 feet north of corduroy bridge over swamp; nail in 42-inch cedar tree east of road	398.20
Bennett's ranch, ½ mile north of; creek bed	398.88
Suiattle River, ½ mile south of mouth of, 8½ miles north of Darrington, in ledge of granite and slate 15 feet above and 15 feet west of road in cut of hill; copper bolt, marked "414 M. C."	416.268
Darrington, 9 miles north of, 200 feet south of cabin on west side of road; nail in 24-inch hemlock stump, 4 feet high, west of road.....	384.48
Darrington, 12½ miles north of, west of road in front of house; nail in fir stump 3 feet high	358.73
Darrington, 14½ miles north of, 10 feet west of road and south of west of island in Sauk River, in rocky bluff 10 feet high, 40 feet above river; copper bolt, marked "333 M. C."	335.784
Darrington, 18½ miles north of, south edge of clearing 200 feet northeast of barn; nail in cottonwood tree east of road.....	257.29
Sauk, 3½ miles south of, 50 feet from northeast of Phillips's fence, 50 feet from slough; nail in 80-inch charred-cedar tree west of road.....	251.43
Sauk, 2 miles south of, north of gate of fork roads to east, about 1,000 feet northwest of bridge over small stream, in sandstone ledge 12 feet west of road; copper bolt, marked "246 M. C."	248.380
Sauk, 1 mile south of; ground at southwest corner of schoolhouse.....	233.64
Skagit River, Sauk Ferry, about mean height of river	202.61
Sauk Ferry, north side, 50 feet from landing; nail in 24-inch lone maple tree in open, broken and leaning	217.13
Sauk, new post-office, road in front of	224.0

SAUK CITY, VIA HAMILTON, TO WOOLLEY.

McKutchen's, ½ mile east of; northeast side of foothill, 30 feet north on trail, in granite rock west of trail; copper bolt, marked "207 T. U. L."	208.623
McKutchen's house, road in front of	205.98
Jackmans Creek, floor of bridge over	191.12
Everett's house, road in front of.....	230.99
Baker River, floor middle of bridge over.....	195.72
Baker, ½ mile west of, at bottom of hill, 40 feet north of fence corner, in granite boulder 50 feet north of road; copper bolt, marked "231 T. U. L."	230.943
Baker, about 4½ miles west of, on bench opposite orchard on river bank; nail in 16-inch fir tree north of road	211.38
Birdsview Hotel, road in front of.....	139.65
Birdsview, about 1 mile west of, 40 feet west of bridge over Grandy Creek, south of road; iron post, marked "142 T. U. L."	142.297
Birdsview, about 3 miles west of, south of road at south end of gravel road; nail in 36-inch fir tree.....	131.39
Hamilton, 4 feet south of station and 5 feet east of southwest corner of platform; iron pipe, marked "96 T. U. L."	95.764
Hamilton, top of rail in front of station.....	94.46
Bridge 46, top of rail.....	94.56
Bridge 45, top of rail	94.57
Bridge 44, top of rail	94.57
Bridge 43, top of rail.....	89.67
Bridge 42, top of rail.....	88.08
Bridge 41½, top of rail.....	84.08

TRIANGULATION AND SPIRIT LEVELING.

489

	Feet.
Bridge 41, top of rail.....	83.69
Bridge 40, top of rail.....	85.59
Lyman, station at; road crossing, top of rail	86.90
Bridge 39, top of rail.....	69.11
Bridge 38, top of rail.....	68.81
Bridge 37, top of rail.....	67.31
Minkler & Son's shingle mill, 700 feet west of Bridge 37, 125 feet east of switch, south of track between platform and cook house; iron pipe, marked "65 T. U. L."	64.377
Bridge 36, top of rail.....	66.22
Bridge 35, top of rail.....	66.53
Bridge 34, top of rail.....	70.93
Crossing Seattle and Northern Railway and Fairhaven and Southern Railroad; top of rail.....	74.44
Bridge 33, top of rail.....	68.84
Bridge 32, west end of; top of rail.....	67.54
Woolley, 20 feet northeast of northeast corner of station; iron pipe, marked "50 T. U. L."	49.855

WOOLLEY, VIA SEATTLE AND INTERNATIONAL RAILWAY, TO ARLINGTON.

Crossing Seattle and International Railway and Seattle and Northern Railway; top of rail	55.03
Skagit River, 175 feet south of drawbridge switch, south end of trestle; top of rail.....	52.27
Eighty-third milepost, road crossing 150 feet north of; top of rail.....	41.08
Clear Lake, 36 feet north of station, 12 feet east of northeast corner of plat- form; iron post, marked "44 T. U. L."	43.623
Clear Lake, track in front of station	43.09
Bridge 49, south end of; top of rail.....	45.58
Bridge 48, top of rail.....	74.50
Parker, track in front of station	91.52
Bridge 47, opposite milepost 77; top of rail	94.32
Montborn, track in front of station	115.34
Bridge 46, top of rail	109.15
Erlich's mill, switch at; top of rail.....	133.06
Bridge 45, top of rail	151.26
Bridge 44, top of rail.....	152.97
Bridge 43, top of rail	172.57
Bridge 42, top of rail.....	184.70
McMurray Lake, water surface.....	226.0
McMurray, opposite sawmill; top of rail at switch	231.59
McMurray, about 1,000 feet north of station, 25 feet east of track, about 300 feet north of seventieth milepost, in colored rock; copper bolt, marked "246 T. U. L."	245.856
McMurray, top of rail in front of station.....	246.10
Sixty-ninth milepost, about 1,200 feet north of road crossing; top of rail.	240.21
Lake Cavanaugh road crossing, about 1,080 feet north of sixty-ninth mile- post, 480 feet east of, in dark-colored rock 8 feet north of road; copper bolt, marked "259 T. U. L."	258.906
Bridge 46, over Pilchuck River, north end of; top of tie.....	151.43
Bryant, road crossing just north of platform; top of rail.....	168.55
Bryant station, 40 feet north of platform, 25 feet west of track; iron pipe, marked "171 T. U. L."	171.227
Bridge 39, middle of; top of tie.....	121.56
Stillaguamish River, south end of railroad bridge over; top of tie.....	86.60

SAUK CITY, VIA MARBLEMOUNT, TO CASCADE PASS.

	Feet.
Von Pressentin's house, road in front of	250. 75
Von Pressentin, $\frac{1}{4}$ mile east of; floor of bridge over ravine	260. 18
Sauk, 6 miles east of, 100 feet south of schoolhouse; floor of bridge	254. 44
Kunde's ranch, 400 feet north of bars to, on north side of road, in conglomerate granite rock 10 feet square, 5 feet high; copper bolt, marked "291 T. U. L."	291. 457
Sec. 13, T. 35 N., R. 10 E., northeast corner of	311. 0
Marblemount, $\frac{1}{4}$ mile west of, 300 feet northeast of sec. 13, T. 35 N., R. 10 E., south of road; nail in 30-inch hemlock stump	317. 29
Marblemount, forks of main road and Ruby Creek trail, 200 feet west of hotel; nail in 42-inch fir stump at junction	322. 90
Skagit River at ferry; water surface	301. 0
Marblemount post-office, 10 feet west of blacksmith shop, 60 feet east of river; nail in 54-inch cedar stump	312. 96
Marblemount, $2\frac{1}{4}$ miles east of, 50 feet north of road, 200 feet east of gravel slide, in granite rock 7 feet square, 4 feet high; copper bolt, marked "410 T. U. L."	409. 832
Marblemount, 7 miles east of, 200 feet east of bridge over gulch, south of road; nail in 36-inch fir tree	801. 58
Marble Creek at ford; water surface	978. 0
Marble Creek, floor of old bridge	984. 51
Marblemount, 11 miles east of, west end of corduroy and 4 feet above fork road to north; nail in 42-inch cedar stump	1, 031. 84
Hurd's house, 150 feet north of, in granite rock 4 feet high, 10 feet north of road; copper bolt, marked "1057 T. U. L."	1, 056. 876
Marblemount, 14 miles east of, 30 feet east of small bridge, south of road; nail in 54-inch cedar tree	1, 048. 55
Marblemount, 16 miles east of, 50 feet above river, south of trail; nail in 36-inch cedar tree	1, 204. 39
Cascade River, North Fork west end of floor of bridge	1, 374. 53
Mineral Park, 150 feet north of east end of bridge over North Fork, 30 feet east of trail, 50 feet northeast of dugout root house, in granite rock in bank $3\frac{1}{4}$ feet high, projecting 3 feet from earth; copper bolt, marked "1396 T. U. L."	1, 396. 507
Mineral Park, $2\frac{1}{4}$ miles northeast of, north bank of North Fork, 50 feet from old bridge, north of trail; nail in hemlock tree	2, 039. 60
Eldorado Mines, fork trail to	2, 234. 0
Gilbert's cabin, nail in beam at northeast corner of	2, 616. 46
Gilbert's cabin, $2\frac{1}{4}$ miles east of, 100 feet east of rock slide; marked + on sharp point at lower end of granite rock on grassy slope, north of trail. ..	4, 949. 44
Cascade summit; iron post marked "5423." (This post was set in 1897 and the elevation as stamped was based upon an assumed datum at Chelan Falls on the Columbia River.)	5, 391. 986

KITITITAS, KING, SNOHOMISH, AND DOUGLAS COUNTIES.

SNOQUALMIE, SKYKOMISH, AND LEAVENWORTH QUADRANGLES.

The elevations in the following list are based on an aluminum tablet in the walls of the city hall building at Tacoma, hereinbefore described.

All bench marks previously established along the Northern Pacific Railway in this locality, which were based on an assumed elevation at Ellensburg, were restamped to correspond with the new datum.

Therefore all permanent bench marks on which there is the letter T are correctly stamped, and those with the letter E or without letter should be affected by a correction of -5.760.

The leveling was done by Mr. H. K. Kalloch, under the direction of Mr. G. E. Hyde, topographer.

ROSLYN, ALONG COUNTY ROAD, VIA CLEALUM RIVER, TO FISH LAKE.

	Feet.
Roslyn, $\frac{1}{2}$ mile from, 15 feet south of Northern Pacific track, 6 feet south of wooden culvert; nail in top of stump	2, 273. 64
Ronald, northeast side of main street, at southeast corner of old Northern Pacific Coal Company's boarding house, 500 feet south of track; iron post, marked "2345 T"	2, 344. 880
Clealum Lake, foot of and 150 feet from, just east of road and 20 feet from northwest corner of Lake View House; iron post, marked "2150 T"	2, 150. 130
Clealum Lake, foot of; water level May 24, 1898	2, 126. 4
Clealum Lake, head of, in highest point of large granite boulder 15 feet from, 30 feet from road; aluminum plate, marked "2140 T"	2, 139. 827
Morgan's ranch, 200 feet east of, 15 feet west of road and 3 feet from fence; iron post, marked "2157 T"	2, 157. 095
Old road forks, 500 feet northwest from, 15 feet west of road on edge of bench above river; nail in root of red fir tree	2, 263. 07
Clealum River, 150 feet from, just west of road; nail in root of red fir tree 2 feet in diameter	2, 306. 58
Little Salmon La Sac, 1,900 feet north of, just north of road in sharp bend to west; nail in root of red fir tree 28 inches in diameter	2, 328. 56
Big Salmon La Sac, 10 feet west of road, 6 feet from edge of low-river bench, 150 feet east of river; iron post, marked "2394 T"	2, 394. 299
Salmon La Sac, on north slope of hill above, west of road; cross chiseled in highest point of boulder	2, 545. 70
Parish Creek, 400 feet north of, just east of road and 300 feet south of small deserted log cabin 150 feet west of road; nail in root of 12-inch red fir tree	2, 752. 83
Clearing, containing 3 deserted cabins, on edge of and just east of road, in top of large boulder with "U. S. M. M. No. 2, Cle Elum Mining District" cut on west face; aluminum plate, marked "2838 T"	2, 838. 4
"Yankee Camp" and log cabin, 500 feet south of, 6 feet north of road where it runs into river bottom, first north of Big Salmon La Sac; nail in root of hemlock tree 6 inches in diameter	2, 780. 43
Boulder Creek, 200 feet southwest of bridge over, 6 feet north of road, 75 feet south of old log cabin; nail in root of black fir tree	2, 883. 07
Boulder Creek, 100 feet south of bridge over, 30 feet southeast of road, 12 feet northeast and 20 feet northwest from deserted log cabins, 50 feet southwest from 6 by 9 granite boulder; iron post, marked "2895 T"	2, 895. 080
Boulder Creek, bridge over	2, 886. 0
Camp Creek, on bench containing 2 old log cabins just south of, 30 feet east of road; nail in root of 24-inch blazed fir tree	3, 103. 24
Camp Creek ford, 20 feet south of, 100 feet southeast of old log cabin on bench east of road; iron post, marked "3086 T"	3, 085. 733
Jack Somer's cabin, 300 feet north of, just west of road at top of point of low shoulder running into and 75 feet east of river; nail in root of black pine tree 12 inches in diameter	3, 124. 01
Fortune Creek, 30 feet north of north end of bridge over, 18 feet east of road; iron post, marked "3204 T"	3, 203. 604

	Feet.
Silver Creek, 300 feet northwest of, just west of road on north slope; nail in root of 12-inch fir tree	3,344.05
Fish Lake, at foot of; water level June 25, 1898	3,324.0
Fish Lake, 400 feet east of, 100 feet west of Stanton's double log cabin, beside road; nail in root of 16-inch hemlock tree	3,348.87
Fish Lake, in open meadow east of, 90 feet east of road, 105 feet north of small double log cabin, 125 feet west from edge of timber, in granite boulder 6 by 7 by 9 feet; aluminum tablet, marked "3371 T"	3,371.266
Fish Lake, near head of; water level June 27, 1898	3,325.0

LINE FROM CAMAS CREEK, VIA PESHAISTIN CREEK ROAD, TO GREAT NORTHERN RAILWAY.

Peshastin Creek, west end of first bridge below Camas Creek	1,389.8
Marcoe's house, south side of lower sill of lower window	1,371.25
Ballou's ranch, in cultivated field on, 400 feet east of squared log house; nail in top of 3-foot pine stump	1,340.18
County road, south side of Wenache River, at junction of Peshastin road with; 5 feet north of road forks, 12 feet west of fence corner, 2 feet south of wire fence, 85 feet south of 14 by 20 foot log cabin; iron post, marked "1103 T"	1,103.181
Newland's house, 100 feet northwest of, 15 feet west of road; nail in side of stump	1,044.55
Wenache River, ferry crossing; water level July 16, 1898	1,017.0
Peshastin Station, Great Northern Railway, 65 feet southeast of wagon road, 75 feet southwest of track at road crossing and mail catch, 20 feet southeast of small board shack; iron post, marked "1045 T"	1,045.422

LINE FROM PESHAISTIN, VIA GREAT NORTHERN RAILWAY, TO INDEX.

Peshastin siding, west end of switch; top of south rail of main track	1,058.60
Peshastin, 2.3 miles west of, 6 feet north of track, 12 feet southwest of point of bluff at west end of sand-rock grading along Wenache road, 20 feet east of small ravine and filling; iron post, marked "1095 T"	1,095.438
Chumstick Creek, trestle over; bolt head top of west end of north guard rail	1,139.61
Leavenworth, near schoolhouse; west rail at road crossing	1,161.71
Leavenworth, in rectangle formed by north platform of railway station; nail in top of low post	1,165.24
Leavenworth, 120 feet southwest of station office, 5 feet southeast of platform, 3.5 feet southwest of low building; iron post, marked "1165 T" ..	1,165.003
Leavenworth, opposite station window; east rail of main track	1,165.41
Leavenworth, 2.56 miles from, 3,810 feet north of milepost 1676, 6 feet east of track, under low bank and 20 feet east of large boulder; iron post, marked "1309 T"	1,309.413
Milepost 1678, nail in top of south post of rail rack	1,485.33
"Big Eddy" of Wenache River, east of, 4.5 feet west of track, 150 feet north of milepost 1679, at south end of cut around high rock point; iron post, marked "1556 T"	1,555.719
Leavenworth, 8.2 miles northwest of; 13.5 feet east of track, directly east of small island in Wenache River, 360 feet southeast of rocky point at track curve, 1,950 feet south of milepost 1682; iron post, marked "1647 T"	1,646.878
Bridge 374 over Wenache River, south end of; top of east rail	1,683.11
Bridge 374, north end of; top of rail	1,687.36
Chiwankum Creek, south end of bridge 375 over; top of bolt in east guard rail	1,760.03

	Feet.
Chiwankum, 40 feet south of corner of section house, 60 feet southeast of mail catch and switch, 40 feet northeast of track, 4 feet north of telegraph pole; iron post, marked "1814 T"	1,814.464
Chiwankum side track, switch north end of; top of rail at joint	1,846.28
Skinny or Skinners Creek; top of east rail, middle of bridge 376 over	1,881.68
Milepost 1685, 15 feet southwest of signboard, "1 mile to Chiwankum;" nail in top of northeast post of rail rack	1,909.78
Skinny or Skinners Creek; top of east rail, center of trestle 377 over	1,922.72
Skinny or Skinners Creek; top of east rail, center of trestle 378 over	1,960.27
Skinny or Skinners Creek; top of east rail, center of trestle 379 over	2,013.78
Chiwankum Divide (Little Summit), about 750 feet south of top of; top of east rail at road crossing and track sign	2,083.92
Chiwankum Summit, at north end of dirt cut at, 3.42 miles north from Chiwankum, 19 feet east of track, 455 feet north of milepost 1687; iron post, marked "2083 T."	2,082.698
Milepost 1688, road crossing and track sign just south of; top of west rail.	2,058.32
Trestle 380, top of west rail center of	2,040.15
Milepost 1690, 30 feet southwest from signboard "1 mile to Nason Creek;" nail in top of northwest post of rail rack	2,155.93
Nason Creek side track, 0.33 mile east of east switch of, at east and west township line; top of south rail	2,164.60
Nason Creek, 1 mile east of switch at; top of south rail at road crossing and track sign	2,158.46
Nason Creek, 19 feet south of sign post, 975 feet east of switch at west end of side track at, 13 feet north of track; iron post, marked "2162 T." ..	2,161.653
Cougar Creek, trestle 381 over; top of south rail center of	2,145.17
Milepost 1693, 395 feet west of; nail in top of east post of rail rack	2,169.24
Merritt side track; rail joint at east end of switch	2,177.81
Merritt, 133 feet northwest of water tank, 15 feet southeast of 2½-foot stump 6 feet from track, 11 feet southwest from main track; iron post, marked "2186 T."	2,185.716
Milepost 1695; top of north rail opposite west post of rail rack at	2,217.96
Trestle 363; top of north rail center of	2,387.87
Trestle 384, east end of; spike in tie	2,449.0
Merritt, 3 miles west of, 11 feet southwest of track at cut around rock point, 1530 feet west of trestle 384, 930 feet east of bridge 385; iron post, marked "2485 T."	2,485.250
Nason Creek, bridge 385 over; east end of guard rail north side of	2,504.02
Trestle 386; top of north rail center of	2,790.53
Trestle 387; bolt head in top of east end of south guard rail of	2,873.60
Berne, 180 feet east of switch to spur, 7½ feet south of main track, 225 feet west of water tank; iron post, marked "2918 T."	2,918.080
Pine Creek, trestle 388 over; bolt head in top of east end of south guard rail of	2,997.33
Mill Creek, bridge 389 over; spike in center of	3,019.90
Trestle 390, northeast side of; cross timber under ties	3,103.85
Trestle 393; top of north rail center of	3,251.16
Trestle 395; north rail at west end of	3,355.94
Cascade Tunnel, 12½ feet west of main track, 120 feet north of water tank, 780 feet north of main switch, 90 feet southwest of tool house; iron post, marked "3373 T."	3,373.245
Cascade Tunnel, at entrance, 20 feet northeast of small machine shop; Great Northern bench mark, marked "3350.91" on stump	3,383.41
Trestle 09, spike in tie at rail joint 60 feet north of south end and 8 inches west of east guard rail of	3,895.02

	Feet.
Cascade Summit, 225 feet south of section house at, 13 feet west of main track in curve, 345 feet south of north switch of side track; iron post, marked "4061 T."	4,060.896
Cascade Summit; Great Northern bench mark, marked "4029.12" on stump at	4,061.42
Trestle 010; bolthead in west end of south guard rail of	4,029.10
Trestle 012, north of track at trail to Wellington and 180 feet east of; nail in top of upper transverse timber of cribbing, second row from east end.	3,928.85
Trestle 017; bolthead in top of east end of south guard rail of	3,677.96
Wellington, 45 feet southeast of Great Northern Railway engineers' quarters, 75 feet east of switchback track, 15 feet south of trail; Great Northern bench mark, marked "3221.737" on stump	3,254.15
Trestle 027, west end of; bolthead in top of north guard rail	3,166.16
Trestle 028; bolthead in top of south end of west guard rail of	3,119.19
Wellington, 16 feet north of new station, 15 feet south of section house, 20 feet east of main track; iron post, marked "3114 T."	3,114.189
Wellington, opposite new station; top of east rail of main track	3,112.96
Wellington, northwest of roundhouse; nail in sill of northeast corner of building west of track	3,108.60
Snowshed No. 2, under east portal of; top of north rail	3,016.26
Snowshed No. 3, stringer south side of west end of	2,986.64
Milepost 1720, 6 feet south of rail rack at, 18 feet south of track; nail in top of blazed stump	2,858.06
Trestle 396; bolthead in east end of north guard rail of	2,773.93
Trestle 397; top of north rail center of	2,730.82
Snowshed No. 4, west end of; nail in top of north end of last sill on south side	2,713.58
Trestle 398; bolthead in east end of south guard rail of	2,708.45
Trestle 403, at west end of Lower Madison loop; bolthead in top of south end of east guard rail of	2,115.95
Madison, 75 feet southeast of roundhouse, 45 feet east of dwelling house, 16 feet south of main track, 260 feet west of east end of side track, 15 feet east of 26-inch stump; iron post, marked "2106 T."	2,105.898
Trestle 505; bolthead in top of west end of south guard rail of	1,797.07
Trestle 406; bolthead in top of west end of south guard rail of	1,745.06
Trestle 407; bolthead in top of west end of south guard rail	1,718.40
Trestle 408; bolthead in top of west end of south guard rail	1,652.76
Trestle 409; bolthead in top of west end of south guard rail	1,630.53
Trestle 411; bolthead in top of east end of south guard rail	1,527.06
Trestle 412; bolthead in east end of north guard rail	1,509.79
Trestle 413; bolthead in east end of north guard rail	1,494.05
Madison, 7 miles from; 5 miles from Skykomish, 9 feet east of track in south end of small gravel pit, 600 feet south of signboard "Bridge 418 1 mile," 420 feet north of milepost 1734; iron post, marked "1389 T." ...	1,389.116
Trestle 415; bolthead in north end of west guard rail	1,364.59
Trestle 416; bolthead in north end of west guard rail	1,351.60
Trestle 417; bolthead in north end of west guard rail	1,345.27
Foss River, bridge 418 over; bolthead in west end of south guard rail ...	1,279.44
Trestle 419; bolthead in north end of west guard rail	1,209.05
Trestle, unnumbered, 120 feet north of signboard "Bridge No. 418 1 mile;" bolthead in north end of west guard rail	1,177.09
Skykomish, 80 feet west of station, 20 feet east of water tank, 15 feet south of main track; iron post, marked "930 T."	929.526
Trestle 420; bolthead in east end of north guard rail	925.35
Trestle 421; bolthead in east end of south guard rail	921.98
Trestle 422; bolthead in west end of south guard rail	926.05

TRIANGULATION AND SPIRIT LEVELING.

495

	Feet.
Bridge 423, just east of; top of south rail at road crossing.....	898. 87
Miller Creek, bridge 423 over; bolthead in west end of south guard rail..	892. 89
Skykomish River, bridge 424; top of granite pier on south side of center of.	864. 60
Trestle 426; bolthead in east end of south guard rail.....	856. 77
Trestle 428; bolthead in west end of south guard rail.....	790. 07
Trestle 429; bolthead in west end of south guard rail.....	767. 08
Salmon side track, east end of; top of south rail at switch.....	766. 47
Salmon, 12 feet north of track and 130 feet east of switch at west end of side track; iron post, marked "759 T."	759. 126
Trestle 431, west end of north guard rail.....	749. 91
Bridge 433, new road bed, north abutment of; nail in top of east end of transverse timber.....	724. 60
Trestle 435, bolthead in west end of north guard rail.....	571. 26
Skykomish River, North Fork of, east guard rail center of bridge 436 over.	540. 25
Index, at station, 40 feet southwest of agent's window, 27 feet southwest of track; iron post, marked "532 T."	531. 586

INDEX VIA GALENA TO MINERAL CITY.

Index, 1 mile from, 50 feet northeast of log cabin; nail in root of twin alder tree just south of trail	572. 63
S. H. Clement's homestead, 220 feet south of cabin on; nail in root of stump just southeast of road.....	754. 11
R. E. Curry's homestead, 200 feet south of cabin of squared logs in fenced clearing on; nail in root of 6-foot cedar stump just southeast of road...	819. 51
Dearborn homestead, south end of fence clearing; nail in root of 4-foot cedar stump just east of road	996. 48
Salmon Creek, east end of bridge across; ground.....	1, 016. 0
Silver Creek and North Fork Skykomish River, junction of; high water creek bed at	1, 083. 0
Galena, 6 feet southwest of corner of "Silver Creek Store," 12 feet east of road; iron post, marked "1110 T."	1, 110. 157
Scott & Westland trail, junction with, at upper end of switchback, 50 feet south of small ravine and creek; nail in root of 16-inch hemlock.....	1, 530. 45
Vandalia trail, at junction with; just south of Vandalia mill site, 400 feet north of "Uncle Sam" cabin; nail in root of 16-inch dead snag	1, 707. 18
"Billy Lee" mining camp, 85 feet east of cabins at, 20 feet east of trail; nail in root of 3-foot stump on edge of bluff	1, 805. 81
"Billy Lee" camp, 650 feet north of, opposite low bench in bend of river; nail in root of 3½-foot hemlock just west of trail.....	1, 836. 14
Mineral City, 6 feet west of U.S.M.M. No. 1, just north of trail, 75 feet northeast of broken-down cabin of squared logs; nail in root of 3½-foot spruce.....	2, 070. 98
Mineral City, 0.9 mile northeast of, 2,300 feet north of log cabin west of trail, above creek crossing, 12 feet northwest from trail; nail in root of 4½-foot hemlock tree; "14" cut in B.M	2, 521. 25
Molybdenum Creek, in strip of timber running through bare hill, just south of; nail in root of 3-foot red fir just northwest of trail; B.M. "15" cut in tree	2, 545. 10

SPOKANE COUNTY.

SPOKANE QUADRANGLE.

The elevations in the following list are based on an aluminum tablet in the top of the latitude pier in the grounds of the county court-house, the elevation of which was accepted as 1,890.954 feet above mean sea

level. The above result was obtained by means of a line with duplicate rods run from a tidal bench mark at Takoma eastward, along the line of the Northern Pacific Railway, by Mr. H. S. Crowe, levelman. Reference to this line is made elsewhere. All elevations on the Spokane quadrangle are stamped with the letter "S," indicating that they are based on the latitude pier above referred to. The leveling was done under the general direction of Mr. Van H. Manning, topographer, by Mr. J. H. Carlock.

SPOKANE VIA SPOKANE FALLS AND NORTHERN RAILWAY TO DRAGOON.

	Feet.
Mead, 100 feet southwest of depot, in line with telegraph poles; iron post, marked "1906 S."	1,905.628
Deadman's Creek, center of bridge over; top of tie	1,821.09
Little Spokane River, bridge over	1,686.0
Dragoon, 90 feet west of station, 20 feet east of road; iron post, marked "1745 S."	1,745.372

DRAGOON VIA WAGON ROAD TO CHATTAROY.

Dragoon Creek, north end of bridge over; floor	1,696.0
Chattaroy post-office, 1,500 feet east of, 30 feet southwest of Davis Mill road crossing Great Northern Railway, in center of bowlder 60 by 40 inches, 2 feet above surface; aluminum tablet, marked "1799 S."	1,798.598

CHATTAROY VIA GREAT NORTHERN RAILWAY TO POINT 1 MILE NORTH OF MILAN.

Davis Mill road crossing, northeast of; spike in telegraph pole	1,794.86
Little Spokane River, north end of first bridge over	1,719.0
Little Spokane River, south end of second bridge over	1,723.0
Milan, 220 feet southeast of station, 160 feet northwest of post-office, in fork of roads; iron post, marked "1779 S."	1,779.427
Milan, 1 mile north of, northeast end of bridge over Little Spokane River; floor	1,795.0

VICINITY OF MILAN VIA MEDLER'S FISH RANCH, SPIRIT LAKE, AND FISH LAKE TO RATHDRUM.

Elk post-office, 4 miles east of, 60 feet northeast of fork of roads, 480 feet south of corner of secs. 13, 14, 23, and 24, T. 29 N., R. 44 E., in bowlder 60 by 40 inches, 20 inches above surface of ground; aluminum bolt, marked "U.S.G.S. 2468 Ft. S. B.M."	2,467.997
Elk post-office, 7½ miles east of, on summit of road 40 feet south of bend, 160 feet west of precipitous break in ridge, in bowlder 40 by 30 inches, 20 inches above ground; aluminum bolt, marked "U.S.G.S. 3112 Ft. S. B.M."	3,112.454
Washington and Idaho State line, 120 feet south of, 240 feet north of old bridge over Blanchard Creek, 20 feet north of road, in center of bowlder 40 by 30 inches, 20 inches above ground; aluminum tablet, marked "2382 S."	2,381.760
Sullivan's ranch, south end of; tack in root of 40-inch yellow pine tree, 4 feet south of road	2,297.99
Spirit Lake, 200 feet east of landing, 6 feet south of road, in center of bowlder 40 by 30 inches, 20 inches above ground; aluminum bolt, marked "U.S.G.S. 2490 Ft. S. B.M."	2,489.993
Spirit Lake, water surface	2,442.0
Fish Lake, 1½ miles north of, 4 feet west and south of fork roads, in top of bowlder 20 by 12 inches 6 inches above ground marked +	2,428.8
Fish Lake, 600 feet east of, northeast of fork of roads, in top of bowlder 10 inches by 6 feet, marked +	2,391.1

TRIANGULATION AND SPIRIT LEVELING.

497

	Feet.
Fish Lake, water surface.....	2, 313. 0
Fish Lake, 1 mile south of, 80 feet south of fork of roads, 15 feet east of road, center of boulder 20 by 10 inches 6 inches above ground; aluminum bolt, marked "U.S.G.S. 2366 Ft. S. B.M.".....	2, 365. 706
Rathdrum, 1 mile east of, at Northern Pacific Railway milepost; top of rail.....	2, 259. 16

SPOKANE VIA TOMKINSON TRIANGULATION STATION TO MEAD.

Spokane, 2½ miles north of, 20 feet east of fork of road, 280 feet northeast of spring west of road; nail in root of pine tree.....	1, 902. 10
Tomkinson triangulation station, about 800 feet southwest of Thomas Tomkinson's house, 400 feet west of road, about 7 miles north of Spokane, in center of stone pier; aluminum tablet, marked "2372 S.".....	2, 371. 766
Mead, 4 miles southwest of, 90 feet northeast of schoolhouse; spike in post at forks of road.....	2, 365. 33
Mead, 2½ miles southwest of, 70 feet northeast of junction of Mead road with Spokane and Clarks Mill road; spike in 12-inch pine tree 10 feet west of road.....	1, 952. 04
Mead, ½ mile southwest of, north of forks of road to Spokane; nail in root of 24-inch pine tree.....	1, 924. 86

DRAGON VIA WAYSIDE TO TOMKINSON TRIANGULATION STATION.

Wayside, in northwest corner of Odd Fellows Hall, 2 feet above ground in stone wall; aluminum tablet, marked "2065 S.".....	2, 064. 877
Wayside, 5 miles south of, 20 feet north of forks of road; nail in root of 14-inch pine west of road.....	2, 031. 30
Wayside, 9 miles southwest of, 80 feet east of road, in sec. 28, T. 27 N., R. 42 E., in center of boulder 60 by 40 inches, 2 feet above ground; aluminum bolt, marked "U.S.G.S. 2889 Ft. S. B.M.".....	2, 889. 260
Little Spokane River, in west sill of north end of bridge over, 11 miles south of Wayside.....	1, 552. 3
Little Spokane River, 2½ miles south of bridge over, at southeast corner of fork road to Fivemile Prairie; tack in top of stump.....	2, 032. 53

CHATTAROY WEST TO DAVIS MILL AND SOUTH AND WEST TO VICINITY OF MEAD.

Deer Creek, east end of bridge over; floor.....	1, 941. 0
Chattaroy, 5 miles east of, 120 feet northwest of corner of secs. 20, 21, 28, and 29, T. 27 N., R. 44 E., 100 feet northwest of forks of road in boulder 60 by 36 inches, 2 feet above ground; aluminum bolt, marked "U.S.G.S. 2065 Ft. S. B.M.".....	2, 064. 772
Chattaroy, 7½ miles east of, 160 feet south of schoolhouse; nail in root of stump, 8 feet north of road.....	2, 202. 97
Davis House, 3½ miles south of, fork of road at top of hill, south of road; top of boulder 30 by 20 inches, 12 inches above ground.....	2, 306. 60
Davis House, 4½ miles south of, at northwest corner of fork of roads; nail in 16-inch stump.....	2, 217. 47
Davis House, 6 miles south of, south corner of forks of roads; nail in 20-inch stump.....	2, 005. 49
Davis House, 7 miles south of, 60 feet southwest of road crossing, in southwest ¼ sec. 27, T. 27 N., R. 44 E.; iron post, marked "1922 S.".....	1, 921. 942
Mead, 4½ miles northeast of, at southwest corner of fork of roads, corner of secs. 4, 5, 32, and 33, T. 27 and 28 N., R. 44 E.; nail in 40-inch stump....	1, 899. 82
Mead, 2½ miles northeast of, at northeast corner of cross roads, in Ts. 26 and 27 N., Rs. 43 and 44 E.; iron post, marked "1881 S.".....	1, 881. 245

	Feet.
Deadman Creek, $\frac{1}{2}$ mile north of, 10 feet south of road crossing, 30 feet west of Spokane Falls and Northern Railway track; nail in telegraph pole	1,872.75
T. 26 and 27 N., R. 43 and 44 E., $1\frac{1}{4}$ miles south of, 140 feet southeast of schoolhouse at cross roads; ground	1,881.0
Deadman Creek, east end of bridge over	1,877.98
Newman Lake, $4\frac{1}{4}$ miles west of, 30 feet north of forks of road at top of hill; tack in root of 10-inch pine west of road	2,732.21
Newman Lake, $\frac{1}{2}$ mile north of, 60 feet southeast of schoolhouse, 8 feet north of road; iron post marked, "2151 S."	2,151.256
Newman Lake, water surface	2,130.0
Newman Lake, $\frac{1}{2}$ mile east of, 3 miles north of Northern Pacific Railway, 30 feet south of forks of road, 1,000 feet east of house, in center of boulder 30 by 20 inches, 1 foot above ground; aluminium bolt, marked "U. S. G. S. 2147 Ft. S. B. M."	2,146.886
Washington and Idaho State line, 0.3 mile west of, 60 feet northeast of road crossing; nail in telegraph pole	2,109.83
Northern Pacific Railway, $6\frac{1}{2}$ miles north of, 20 feet west of forks of road; spike in top of 30-inch pine stump	2,383.11
Northern Pacific Railway, $4\frac{1}{4}$ miles north of, 20 feet west of forks of road; tack in top of 30-inch pine stump	2,339.16
Pleasant Prairie, east end of middle of triangle, center of cross roads; iron post, marked "2431 S."	2,431.393
Northern Pacific Railway, 2 miles north of, 40 feet south and west of forks of road; spike in top of 18-inch pine stump	2,303.55
From Newman Lake to Sucker	2,160.0
Sucker Lake, water surface	2,191.00
CHATTAROY NORTH, VIA COUNTY ROAD, TO THE VICINITY OF MILAN.	
Chattaroy, 500 feet south of, 4 feet north of road; + cut in top of stone 20 by 10 inches, 6 feet above ground	1,701.17
Chattaroy, $2\frac{1}{2}$ miles north of, 4 feet south and west of forks of road; tack in top of stump	1,901.50
Chattaroy, $4\frac{1}{4}$ miles north of, northeast corner of forks of roads; + in top of boulder 10 by 8 inches, 6 inches above ground	1,859.94
Little Spokane River, north end of bridge over	1,762.0
Milan, $\frac{1}{2}$ mile south of, at railroad crossing; spike in telegraph pole 40 feet southeast of Great Northern Railway	1,770.80
WAYSIDE, VIA COUNTY ROAD TO DEER PARK, THENCE VIA SPOKANE FALLS AND NORTHERN RAILWAY TO DRAGOON.	
Wayside, $1\frac{1}{4}$ miles north of, northwest corner of fork of road; nail in 30-inch pine stump	2,068.37
Wayside, 4 miles northwest of, 10 feet northeast of corner to Secs. 27, 28, 33, and 34, T. 28 N., R. 42 E.; iron post, marked "2093 S."	2,093.167
Wayside, 7 miles northwest of, south end of bridge over Dragoon Creek	2,047.0
Deer Park, 1 mile west of, north end of bridge over Dragoon Creek	2,090.0
Deer Park, $\frac{1}{2}$ mile west of, east end of bridge over Dragoon Creek	2,098.0
Deer Park, southeast corner of cross roads at station, 70 feet southeast of post-office, 130 feet east of Spokane Falls and Northern Railway; iron post, marked "2117 S."	2,117.021
Deer Park, 2 miles south of. North end of switch at sawmill	2,049.70
Buckeye Station, top of rail in front of	1,963.70
Dragoon Creek, south end of Bridge No. 10	1,818.0
Dragoon Creek, south end of Bridge No. 9	1,806.0
Dragoon Creek, north end of Bridge No. 8	1,792.0

TRIANGULATION AND SPIRIT LEVELING.

499

DEER PARK, VIA WEST BRANCH POST-OFFICE TO GREAT NORTHERN RAILWAY, 1 MILE NORTH OF MILAN.

	Feet.
Corner of secs. 19, 24, 25, and 30; top of stone.....	2, 221. 18
Deer Park, 4½ miles northeast of, 50 feet south of forks of roads, 80 feet west of county road, 170 feet northwest of secs. 19, 20, 29, and 30, T. 29 N., R. 43 E.; iron post, marked "2268 S.".....	2, 268. 467
Bear Creek, at west end of bridge over	1, 916. 0
Westbranch, 200 feet north of post-office, 30 feet west of bridge over flume, in top of bowlder 48 by 36 inches, 1 foot above ground and 3 feet north of road; aluminum bolt, marked "U.S.G.S. 1906 Ft. S. B.M."	1, 906. 360
Milan, 1 mile north of, at west end of bridge over Little Spokane River ..	1, 793. 71

NORTHERN PACIFIC RAILWAY, 1 MILE WEST OF OTIS, VIA SPRAGUE AVENUE ROAD AND SPOKANE BRIDGE, TO NORTHERN PACIFIC RAILWAY NEAR STATE LINE.

Spokane River, north end of bridge over	2, 002. 0
Spokane River, water surface under bridge.....	1, 981. 0
Spokane Bridge (post-office), 2½ miles southwest of, 100 feet south of school- house; spike in top of post at turn of road.....	2, 125. 21
Spokane Bridge (post-office), 1½ miles southwest of, 30 feet north of small bridge, in stone 14 by 8 inches, 6 inches above ground.....	2, 078. 55
Spokane River, south end of bridge over	2, 040. 0
Spokane River, water surface under bridge	2, 024. 0
Spokane Bridge (post-office), 160 feet northwest of post-office, 20 feet west of forks of road; spike in telegraph pole.....	2, 092. 54

SPOKANE BRIDGE (POST-OFFICE), EAST 2 MILES.

Liberty Lake, 500 feet north of, 100 feet west of schoolhouse, 20 feet east of road; iron post, marked "2098 S.".....	2, 098. 461
Liberty Lake, water surface	2, 053. 0
State line, 3½ miles south of Spokane Bridge (post-office), 20 feet south of forks of road, + cut in top of stone 20 by 16 inches above ground	2, 370. 38
Denison's field, 10 feet south of gate to; spike in top of post.....	2, 551. 89
Sprague avenue road, 2½ miles southwest of, 130 feet north of forks of road, 60 feet northeast of schoolhouse; iron post, marked "2131 S.".....	2, 130. 575
Sprague avenue road, 4½ miles southwest of, 100 feet south of forks; spike in root of 30-inch pine tree, 4 feet east of road.....	2, 330. 58
East Spokane, 80 feet west of post-office, 20 feet south of road, 160 feet south of track; iron post, marked "1933 S.".....	1, 932. 941
East Spokane, 2½ miles southeast of, 180 feet north of house, 40 feet north- west of old road crossing, 1 foot south of telegraph pole; + cut in top of stone	1, 979. 96
Chester, 2 miles northwest of, 70 feet west of road crossing, 3 feet north of road; + cut in top of stone 20 by 10 inches, 8 inches above ground.....	1, 991. 65
Culvert 202, north end of.....	2, 005. 0
Chester, 200 feet northwest of section house, 30 feet north of fork of roads, 60 feet north of track; iron post, marked "2011 S.".....	2, 010. 761
Culvert No. 200, north end of.....	2, 058. 0
Culvert 198, south end of.....	2, 159. 0
Trestle 195, spike in east end of south sill.....	2, 276. 90
Milepost 436, top of rail opposite.....	2, 303. 81
Mica, top of nail in front of.....	2, 478. 72
Mica, 250 feet east of post-office, 100 feet west of track, 80 feet south of fork of road, in center of bowlder 50 by 30 inches, 30 inches above ground; aluminum bolt, marked "U.S.G.S. 2478 Ft. S.B.M."	2, 478. 426
Freeman, 1½ miles southeast of, 60 feet south of road crossing, 50 feet east of forks, 200 feet southwest of church; iron post, marked "2600 S."	2, 600. 306
Buckley switch, 40 feet north of, between switch and track	2, 499. 87

OLSEN SWITCH, EAST VIA COUNTY ROAD TO VICINITY OF STATE LINE.

	Feet.
Olsen switch, 3 miles east of, 20 feet south of fork of road; spike in top of 24-inch pine stump.....	2,766.83
W. F. Horton's house, 50 feet south of road, 800 feet west of State line, in masonry in northeast corner; aluminum bolt, marked "U.S.G.S. 2690 Ft. S.B.M."	2,689.742
W. F. Horton's house, 1 mile north of State line, 20 feet northeast of fork of roads; spike in top of 12-inch pine stump.....	2,552.19
Oregon Railroad and Navigation Company's track, 3 miles west of, 20 feet south of fork of roads, at top of hill, in center of bowlder 28 by 12 inches, even with ground; aluminum bolt, marked "U.S.G.S. 2512 Ft. S.B.M."	2,512.128
Hangman Creek, $\frac{1}{4}$ mile east of; 800 feet west of fork of road, south end of ridge, 20 feet north of road, in center of bowlder 30 by 20 inches, even with ground; aluminum bolt, marked "U.S.G.S. 1927 Ft. S.B.M."	1,927.364
Hangman Creek, water surface	1,905
Hangman Creek, $2\frac{1}{4}$ miles west of, at top of hill 50 feet east of forks of road, 140 feet north of telephone line; iron post, marked "2454 S."	2,454.336
Palouse branch of the Union Pacific Railway, milepost 4, track opposite..	2,271.86
Palouse branch of the Union Pacific Railway, milepost 4, $\frac{1}{4}$ mile north of, 80 feet east of road crossing, 40 feet east of small bridge, 20 feet east of forks of road; iron post, marked "2272 S."	2,272.250
Palouse branch of the Union Pacific Railway, milepost 2, spike in telegraph pole opposite.....	2,160.01
Marshal Junction, spike in telegraph pole in front of station.....	2,128.88

SPOKANE, VIA GREAT NORTHERN RAILWAY, WEST 4 MILES.

Spokane, southeast corner of Cedar and Boone streets; spike in telegraph pole	1,895.02
Alta Vista, center of track	1,822.11
Spokane River, east end of bridge over	1,811.35
Spokane River, water surface.....	1,673.75
Junction Great Northern and Seattle and Lake Shore railroads, $\frac{1}{4}$ mile west of, 30 feet southwest of P. C., in north face of bowlder 12 by 10 feet, 10 feet above ground; aluminum bolt, marked "U.S.G.S. 1903 Ft. S.B.M."	1,903.254

JUNCTION GREAT NORTHERN AND SEATTLE AND LAKE SHORE RAILROADS SOUTH 7 MILES.

Junction, $1\frac{1}{4}$ miles south of, 20 feet east of road crossing, top of bowlder 50 by 40 inches, 30 inches above ground	1,960.7
Junction, $6\frac{1}{4}$ miles south of, 40 feet southwest of road crossing; spike in telegraph pole	2,224.63
Junction, 7 miles south of, 130 feet east of road crossing, 80 feet east of track, in center of bowlder 30 by 20 inches, 20 inches above ground; aluminum bolt, marked "U.S.G.S. 2267 Ft. S.B.M."	2,266.558
Sections 3, 4, 33, and 34, 20 feet north of road crossing; spike in post.....	2,315.69
Mount Carlton, summit of; aluminum bolt, marked "U.S.G.S. 5808 (V.A.) S.B.M."	5,808

WASHINGTON-IDAHO-MONTANA.

TACOMA TO MISSOULA.

The elevations in the following list are based on an aluminum tablet in the southeast corner of the City Hall building in Tacoma. The elevation of the + mark on this tablet was determined as 109.968 feet

above mean sea level from information furnished by the United States Coast and Geodetic Survey and a State official. The United States Coast and Geodetic Survey determined the zero of the Tacoma city datum, which is a + mark on the top of the coping of the corner stone of the City Hall, to be 13.86 feet below local mean sea level, and Mr. Bowen, of the State swamp and tide land commission determined the elevation of the city datum to be 124.10 feet above its zero, hence by combination the city datum is 110.24 feet above local mean sea level.

There are two elements of weakness in the accepted elevation at Tacoma. One is from the fact that there was no bench mark recoverable which had been established by the United States Coast and Geodetic Survey in connection with their tidal observations, and the other is from the fact that the tidal observations taken necessarily have reference to local mean sea level rather than to the mean elevation of the ocean. However, by various checks secured, the evidence was very conclusive that the accepted elevation of the city datum bears its true relation to the local mean sea level, and it is considered that the difference between the outer or ocean plane and that at Tacoma is infinitesimal.

The line was carried along the track of the Northern Pacific Railway and the leveling was done by Mr. H. S. Crowe.

TACOMA TO ORTING.

	Feet.
Tacoma, City Hall building, + on top of coping of corner stone of.....	110.240
Tacoma, in wall of City Hall building, on Seventh street side, northwest corner of Seventh street and Pacific avenue, southeast corner of building, about 2 feet above sidewalk; aluminum tablet, marked "110 T."...	109.968
Tacoma, + on top of iron step north end of entrance to Tacoma News office, on Railroad avenue side.....	102.81
Tacoma, + on northeast end of stone steps of McDonald's cigar store on northwest corner of Pacific avenue and Eleventh street.....	92.05
Tacoma, + cut in brick on south side of building of Tacoma Railway and Motor Company, about 3 feet above sidewalk, 27.9 feet south from northwest corner of office building on A street, opposite Thirteenth.....	71.32
Tacoma, top of tie center of track, center of drawspan of bridge over channel on Northern Pacific Railway.....	25.52
Tacoma, 1½ miles east of, near east line of Puyallup Indian Reservation; copper nail on east end of center cap of wagon-road bridge on north side of railroad.....	5.81
Prescott station, center of track at top of tie.....	8.00
Reservation platform, top of rail at road crossing.....	12.12
Tacoma, 2½ miles east of; copper nail in cap of east bulkhead bent of trestle, south side of track.....	17.76
Milepost 3, 250 feet east of; top of rail south side of track at road crossing.....	18.98
Milepost 4, 350 feet east of; copper nail on cap of east bulkhead bent of trestle 249, south side of track at Clear Creek.....	16.37
Milepost 5, 270 feet east of; in top stone of stone culvert, 1 foot from east end of stone, 10.7 feet from center of south track; copper plug, marked "21 T.".....	20.943
Milepost 6, 800 feet east of; water surface Clarks Creek at trestle 245....	22.53

	Feet.
Milepost 6, 800 feet east of; copper nail on west bulkhead cap on south-west corner of trestle 245 over Clarks Creek.....	29.07
Milepost 7, 315 feet east of; nail on telegraph pole on south side of track.	34.54
Puyallup, 1½ miles west of; center of track at road crossing 7½ miles east of Tacoma.....	42.13
Puyallup, 1 mile west of; copper nail in notch cut on cottonwood tree 30 inches in diameter, 150 feet west of 8-mile post.....	42.93
East Puyallup, base of rail in front of telegraph office.....	49.52
Puyallup, northeast corner of building of J. P. Stewart & Sons, in fifth row of bricks above corner stone, corner of Stewart and Meridian streets; aluminum tablet, marked "49 T.".....	48.768
Meeker Junction, top of rail at.....	60.59
Meeker Junction, copper nail on lower step at west end of platform.....	58.99
Ten-mile post, 1,200 feet east of; copper nail on fir stump 15 feet north of track.....	75.41
Alderton, ¼ mile west of; center of track at road crossing 3 miles east of Puyallup.....	77.04
Alderton station, 150 feet east of water tank, 23 feet north of center of wagon road, 36.6 feet from center of track, 4.7 feet from south corner of east and west fence; iron post, marked "89 T.".....	88.963
Milepost "Tacoma 13, Prescott 241," copper nail in top of, about 4.6 miles east of Puyallup.....	114.03
McMillan station, ¼ mile west of; top of rail at road crossing.....	112.55
McMillan station, ¼ mile west of; 20-penny wire nail on south side of signpost "Tacoma 14 miles, Pascoe J. 240," north side of track.....	121.0
McMillan station, top of rail at.....	122.40
McMillan station, ¼ mile east of; water surface south fork of Puyallup River.....	112.0
McMillan station, ¼ mile east of; copper nail on southwest end of cap of main bridge over South Fork of Puyallup River No. 243.....	127.26
McMillan station, 1½ miles east of; railroad spike in south side of milepost 16.....	151.81
McMillan station, 2 miles east of; top of rail south side of track, where road crosses track toward Orting.....	147.65
Orting station, ¼ mile west of; railroad spike in south side of milepost 17.	177.41
Orting station, top of rail in front of.....	191.73
Orting station, 150 feet west of water tank, 34.2 feet from center of track on south side, 3 feet west of telegraph pole, 53 feet west of center line of Bridge street; iron post, marked "198 T.".....	197.749

ORTING TO CUMBERLAND.

Orting station, 1.1 miles east of, 225 feet west of milepost 19 at Hoyts Creek; copper nail on first bent from east end of bridge 241, southeast corner of cap.....	220.26
Orting station, 2.2 miles east of; copper nail on top of milepost 20 to Tacoma—"Pasco J. 234".....	269.40
Carbon River bridge 234 (first crossing); water surface.....	295.9
Carbon River bridge 234; copper nail in top of timber eleventh chord from west end of.....	308.28
Carbon River, 1½ miles east of; copper nail in top of milepost "Tacoma 22, Pascoe J. 232".....	319.47
Carbon River, 2½ miles east of; on iron wedge driven in side of milepost "Tacoma 23, Pascoe J. 231".....	341.70
Milepost "Tacoma 24, Pascoe J. 230," copper tack in top of; 3½ miles east of Carbon River.....	397.60

	Feet.
South Prairie, top of rail in front of depot.....	428.0
Carbon River, bridge 231 (second crossing) surface of water.....	431.4
South Prairie, 50.7 feet east from northeast corner of station at, 2.3 feet west of telegraph pole, 19.1 feet from center of track; iron post, marked "430 T.".....	429.672
South Prairie, 1.1 miles east of; surface of water, South Prairie Creek bridge 230.....	470.7
South Prairie, 2 miles east of; copper nail south end of west bulkhead cap of trestle 228 over South Prairie Creek.....	541.82
South Prairie, 2½ miles east of; on railroad spike on north side of milepost 27.....	566.63
South Prairie, 3½ miles east of; on railroad spike on south side of milepost 28.....	645.47
South Prairie, 4½ miles east of; copper nail in top of milepost 29.....	721.05
Buckley, 800 feet west of station at; on railroad spike south side of milepost 30.....	723.95
Buckley, southwest corner of Collins & McNicoll's butcher shop on corner of River avenue and Main street; aluminum tablet, marked "723 T."...	722.715
Buckley, top of rail in front of station.....	723.4
Buckley, 1 mile east of; railroad spike on south side of milepost 31 at west end of bridge over White River.....	692.93
White River, water surface from wagon-road bridge.....	629.4
Boise Creek, copper nail in cap of east bulkhead of trestle over.....	711.18
Boise station, 800 feet west of; road crossing.....	702.0
Boise Creek, water surface under railroad bridge.....	691.2
Boise Creek, ¼ mile from; on railroad spike on milepost 33.....	738.03
Enumclaw, 77.9 feet west of southwest corner of station, 3.1 feet east of mail crane, 31 feet west of center line of Griffin avenue; iron post, marked "742 T.".....	741.768
Enumclaw station, top of rail in front of.....	741.66
Enumclaw, ¼ mile east of; railroad spike in milepost 34.....	741.36
Enumclaw, 1½ miles from; railroad spike on south side of milepost 35....	729.94
New Wakum Creek, 3½ miles east of Boise Creek; water surface.....	722.3
New Wakum Creek, copper nail on southeast end of east bulkhead cap of trestle over.....	725.88
Milepost 36, on railroad spike in.....	728.43
New Wakum Creek, 1.1 miles east of; iron wedge driven in south side of milepost 37.....	744.72
New Wakum Creek, 1.2 miles east of, 250 feet east of milepost 37; road crossing.....	746.06
Coles Creek, 1.7 miles east of New Wakum Creek; water surface.....	764.9
Coles Creek, 1.7 miles east of New Wakum Creek; copper nail in cap of east bulkhead bent of trestle 218.....	773.94
Veazie station, 76.6 feet from main track, 15 feet from center of side track on north side of main line and 50 feet east of road crossing; iron post, marked "777 T.".....	776.759
Veazie station, 0.3 mile east of; railroad spike on milepost 38.....	779.73
Veazie, 1.3 miles east of; railroad spike on milepost 39.....	838.11
CUMBERLAND TO STAMPEDE.	
Cumberland, copper nail in last plank in east end of platform of station, 5.7 feet from center of track.....	855.97
Cumberland, 700 feet east of station; copper nail in east stanchion of extra rail post opposite 40-mile post.....	851.67
Cumberland station, 1½ miles east of; 20-penny wire nail in side of milepost 41.....	868.51

	Feet.
Cumberland station, 2½ miles east of; railroad spike on milepost 42.....	884. 16
Palmer station, 96.4 feet west of southwest corner of, 5 feet west of mail crane, 10.4 feet from center of track, 20 feet west of center of road crossing; iron post, marked "882 T."	881. 598
Cumberland, 3½ miles east of; railroad spike in side of milepost 43.....	870. 31
Cumberland, 4½ miles east of; railroad spike on milepost 44.....	858. 97
Thorough Cut, just east of, 5½ miles east of Cumberland, at east end of rock cut; copper nail in root of stump 250 feet east of milepost 45.....	907. 31
Green River, ninth crossing, bridge 213; water surface.....	880. 4
Green River, eighth crossing, bridge 212; water surface.....	891. 5
Bridge 212, ¼ mile east of, near milepost 46; railroad spike in upright timber on north side of east portal of tunnel No. 8.....	932. 78
Tunnel No. 8, center of track, west portal.....	929. 8
Tunnel No. 8, center of track, east portal.....	931. 7
Green River, seventh crossing, bridge 211; water surface.....	901. 2
Milepost 47, 75 feet east of; copper nail on west bulkhead cap, north side of trestle.....	969. 18
Milepost 48, 10 feet west of; railroad spike on cedar stump.....	1, 016. 59
Green River, sixth crossing, 25 feet west of tunnel No. 7, on north corner of east bulkhead pier of steel bridge No. 210; copper bolt, marked "1046 T."	1, 045. 780
Green River, sixth crossing, water surface.....	1, 010. 1
Tunnel No. 7, center of track, west portal.....	1, 046. 4
Tunnel No. 7, center of track, east portal.....	1, 046. 3
Eagle Gorge, ¼ mile west of, bridge No. 209, fifth crossing of Green River; water surface.....	1, 054. 3
Eagle Gorge station, ¼ mile east of; on railroad spike north side of telegraph pole ¼ mile east of milepost 50.....	1, 097. 10
Eagle Gorge, 1½ miles east of; railroad spike in milepost 51.....	1, 115. 25
Eagle Gorge, 2½ miles east of; railroad spike in milepost 52.....	1, 139. 12
Eagle Gorge, 3 miles east of; ——— Creek, bridge 208; water surface	1, 122. 9
Eagle Gorge, 3½ miles east of; railroad spike on milepost 53.....	1, 169. 18
Canton, top of rail in front of railroad office.....	1, 202. 74
Canton, 8.2 feet east of east end of railroad tool house, 2 feet west of telegraph post; iron post, marked "1205 T."	1, 205. 100
Canton station, 0.1 mile east of; railroad spike on milepost 54.....	1, 209. 24
Canton, 1.1 miles east of; railroad spike on milepost 55.....	1, 238. 08
Canton station, 2.1 miles east of; on railroad spike on milepost 56.....	1, 262. 72
Canton station, 3.1 miles east of; on railroad spike on milepost 57.....	1, 301. 82
Maywood station, 2.2 feet east of southeast corner of section house, 4.1 miles east of Canton; iron post, marked "1335 T."	1, 334. 907
Canton, 5.1 miles east of; railroad spike on milepost 59.....	1, 367. 89
Green River, fourth crossing, bridge 206; water surface.....	1, 375. 2
Green River, bridge 207; water surface.....	1, 354. 4
Canton, 6.1 miles east of; railroad spike on milepost 60.....	1, 396. 53
Wolf Creek, bridge 205; water surface.....	1, 405. 9
Milepost 61, railroad spike on.....	1, 446. 45
Milepost 62, railroad spike on.....	1, 481. 19
Mill Creek, water surface.....	1, 505. 0
Hot Springs, 56 feet east of southeast corner of depot, 17.6 feet north of center of track, 3 feet west of telegraph pole; iron post, marked "1531 T."	1, 531. 041
Hot Springs, top of rail in front of depot.....	1, 529. 49
Green River, bridge 202; base of rail.....	1, 539. 70
Green River, bridge 202; surface of water.....	1, 530. 8
Hot Springs, 1½ miles east of; + on concrete coping of west bulkhead pier of iron bridge 201, crossing of Green River.....	1, 571. 24

	Feet.
Green River, bridge 201; base of rail.....	1,572.79
Green River, bridge 201; surface of water.....	1,557.1
Lester, in brick projection at southwest corner of roundhouse; aluminum tablet, marked "1614 T.".....	1,614.345
Lester, top of rail in front of station	1,609.93
Lester, 1 mile east of; railroad spike on milepost 66.....	1,653.56
Friday Creek, 2 miles east of Lester; copper nail on east bulkhead cap southeast corner of trestle No. 200.....	1,713.06
Friday Creek; water surface.....	1,707.6
Sunday Creek; base of rail center of bridge	1,737.54
Sunday Creek; surface of water under bridge	1,697.4
Sunday Creek, 2.2 miles east of Lester; knob on northeast corner of south end of east bulkhead pier (concrete) of railroad bridge over.....	1,736.15
Lester, 3 miles east of; railroad spike on milepost 68.....	1,781.14
Green River, iron bridge, base of rail center of track crossing.....	1,822.86
Green River, railroad bridge; water surface	1,806.5
Milepost 70, on square-headed bolt driven in side of.....	1,868.94
Weston, $\frac{1}{2}$ mile from; on copper plug set in east end of top of stone retaining wall	1,901.86
Milepost 71, railroad spike in.....	1,971.85
Milepost 72, railroad spike on	2,088.12
Milepost 73, railroad spike on.....	2,199.40
Milepost 74, railroad spike on.....	2,312.66
Milepost 75, railroad spike on	2,426.03
Stampede, 75 feet southwest of station and 10 feet northwest of bluff over Deer Creek; iron post, marked "2776 T.".....	2,775.503

STAMPEDE TO THORP.

(The levels relating to the portion of the Northern Pacific line between Stampede and Thorp are republished from the list published in 1896-97 and 1867-98, with the proper correction.)

Stampede Tunnel, 150 feet west of snowshed at west end of; nail in south end of transverse timber, second from top, east end of cribbing north of track	2,803.0
Stampede Tunnel, west end of; nail in log over small stream 12 feet south of track and 100 feet west of snowshed.....	2,797.7
Stampede Tunnel, west end of; nail at base of upright timber north of track west end of snowshed	2,803.6
Stampede Tunnel, at east end of; top of south rail at east end of snowshed	2,832.1
Martin, just west of; bolt in east end of top of lateral timber of cribbing under milepost "Tacoma 81—Pasco 173"	2,779.3
Martin, on bank above track 40 feet east of station and 20 feet south of main track, 6 feet east of telegraph pole; iron post, marked "2782" ...	2,781.918
Martin, top of south rail at center of station	2,774.6
Martin, 1 mile east of; nail in center of top of stump 6 feet north of milepost "Tacoma 82—Pasco 172."	2,671.2
Martin, $1\frac{1}{2}$ miles east of; top of nail at east end of trestle No. 169.....	2,608.54
Martin, 2 miles east of; nail in log at west end of trestle No. 167.....	2,569.3
Easton, 5 miles west of; nail in top of milepost 84.....	2,461.5
Easton, 4 miles west of; nail in side of milepost 85.....	2,350.5
Snoqualmie wagon road, at intersection with Northern Pacific Railway, 12 feet north of railroad track and 15 feet east of wagon road, $3\frac{1}{2}$ miles west of Easton; iron post, marked "2304"	2,303.940
Snoqualmie wagon-road crossing; nail in root of stump 20 feet north of old Northern Pacific, bench mark $3\frac{1}{2}$ miles west of Easton.....	2,305.6

	Feet.
Easton, 3 miles west of; railroad spike in side of milepost 86.....	2, 244. 9
Cabin Creek; top of rail, center of bridge over.....	2, 223. 6
Easton, 2 miles west of; nail in top of milepost 87.....	2, 203. 3
Easton, 1 mile west of; nail in top of intersection of signboards on milepost 88.....	2, 188. 6
Easton, 90 feet northwest of northwest corner of station, 110 feet north of track at water tank and 80 feet south of general store and post-office; iron post, marked "2166".....	2, 165. 928
Easton, 0.8 mile east of; nail in root of stump 30 feet south of track, 150 feet west of road crossing.....	2, 128. 1
Big Creek, 1½ miles west of; nail in stump 12 feet south of track and 75 feet east of road crossing and milepost 91.....	2, 103. 7
Big Creek, ¼ mile west of; nail in center of top of stump 15 feet north of track and 40 feet east of milepost 92.....	2, 090. 5
Big Creek; top of north rail, center of trestle No. 155, just west of side-track at station.....	2, 102. 0
Big Creek; 25 feet north of west pillar of signpost at siding, 35 feet north of main track, and 150 feet east of trestle No. 56 over small creek; iron post, marked "2103".....	2, 102. 978
Big Creek; top of rail, center of bridge over.....	2, 101. 8
Trestle No. 151; top of north rail at center of, 1½ miles west of Nelson...	2, 074. 2
Nelson, 1½ miles west of; spike in top of stump 15 feet north of track and 270 feet west of milepost 94.....	2, 081. 1
Nelson, ¼ mile west of; nail in stump 25 feet south of track, opposite milepost 95.....	2, 036. 0
Nelson, 3 feet east of fence corner and 12 feet west of large pine tree, 205 feet south of track, 200 feet northeast of house of Peter Nelson and 410 feet southwest by west from signboard "Nelson;" iron post, marked "2030".....	2, 029. 676
Yakima River; bridge at sixth crossing, middle of five indentations at southwest corner of southwest masonry abutment ¼ mile east of Nelson.	2, 020. 1
Nelson, 1 mile east of; top of south rail at road crossing.....	2, 009. 5
Nelson, 1½ miles east of; nail in step of most easterly post of rail rack north of track and just east of milepost 97.....	1, 997. 3
Nelson, 2½ miles east of; nail in top of stump 40 feet south of track, near milepost 98.....	1, 976. 7
Clealum River; top of rail at west end of bridge over.....	1, 977. 6
Clealum, 3 miles west of; spike in cribbing south of track near milepost 99.....	1, 957. 8
Clealum, 2 miles west of; nail in top of stump 10 feet northeast of milepost 100.....	1, 950. 8
Clealum, ¼ mile west of; top of south rail at road crossing to wagon bridge over Yakima River.....	1, 918. 4
Clealum, 1,200 feet west of; top of milepost 102.....	1, 910. 1
Clealum; 84.5 feet west of the center of front door of Reed House and 81.5 feet southeast from southeast corner of Clealum Mercantile Company's store, in SW. ¼ sec. 26, T. 20 N., R. 15 E.; iron post, marked "1905.".....	1, 905. 53
Teaaway station, 200 feet north of; on section line 30 feet south of corner of secs. 4, 5, 32, and 33, T. 19 N., R. 16 E.; iron post, marked "1838.".....	1, 837. 745
Teaaway station, 1 mile east of; on top of rail at western end of Teaaway River bridge.....	1, 824. 4
Bristol station, 14.3 feet north of center of track and 40 feet southwest of southwest corner of section house and under signboard "Bristol," west side of NW. ¼ sec. 13, T. 19 N., R. 16 E.; iron post, marked "1784.".....	1, 784. 472
Dudley station, just west of; top of milepost 116.....	1, 715. 3

	Feet.
Dudley station; top of rail at rail joint, opposite center of platform	1,703.3
Bridge No. 135, at fifth crossing of Yakima River; top of rail at center of bridge, about 2½ miles north west of Thorp and ¼ mile southeast of Dudley	1,691.7
Thorp, 1½ miles northwest of, at first road crossing, 140 feet north of railroad close to wagon road, on the south side of SE. ¼ sec. 34, T. 19 N., R. 17 E., and very close to the township line; iron post, marked "1658."	1,658.49
Railroad signboard "Thorp 1 mile;" top of south rail joint immediately opposite, 1 mile northwest of Thorp station	1,657.8
Thorp railroad station; top of rail in front of	1,634.8

THORP TO ELLENSBURG.

Thorp, in northeast ¼ of sec. 11, T. 18 N., R. 17 E., at intersection of Main street and Taneum Creek road; iron post, marked "1634 T."	1,633.831
Thorp station, ¼ mile east of; railroad spike on milepost 120	1,624.47
Bridge 130, base of rail center of	1,625.20
Bridge 130, surface of water under	1,619.2
Yakima River, fourth crossing, Bridge 129; base of rail, center of	1,623.16
Thorp station, 1½ miles east of; surface of water under bridge, fourth crossing of Yakima River	1,603.6
Milepost 121, railroad spike on	1,614.76
Trestle 128, base of rail center of	1,595.76
Milepost 122, railroad spike on	1,593.13
Milepost 122, 1,830 feet east of; on cross on sandstone inside of frame tower on north side of railroad track and east of road crossing, stone, marked "U. S. + Base."	1,584.55
Bridge 125, 850 feet east of milepost 123; copper nail on south end of west bulkhead timber of	1,576.71
Trestle 126, 3½ miles east of Thorp station; base of rail	1,580.28
Trestle 126, 3½ miles east of Thorp; water surface under	1,574.4
Trestle 125, base of rail	1,576.83
Trestle 124, base of rail	1,573.54
Trestle 124, water surface under	1,566.5
Waldo Spur, base of rail opposite	1,573.40
Trestle 123, base of rail center of	1,573.30
Trestle 122, 390 feet west of milepost 124; copper nail in north end of west bulkhead cap of	1,565.43
"Mason's," center of track at road crossing	1,561.3
Trestle 121, center of track, base of rail	1,559.85
Milepost 125, ship spike on	1,553.32
Trestle 120, base of rail center of	1,552.84
Trestle 119, base of rail east end of	1,548.11
Trestle 118, flume Yakima Power Company; water surface	1,525.4
Trestle 118, base of rail center of	1,530.30
Milepost 126, railroad spike on	1,528.19

ELLENSBURG TO NORTH YAKIMA.

Ellensburg, Washington, on center of stone marking south end of base line	1,514.2
Ellensburg, corner of Fifth street and railroad; road crossing center of track	1,511.66
Bridge 118, base of rail center of	1,518.84
Bridge 118, surface of water	1,511.8
Trestle 117, base of rail	1,511.54
Wilson Creek, bridge 117; surface of water	1,508.3

	Feet.
Ellensburg, top of rail in front of telegraph office.....	1,510.10
Ellensburg, in top of brick pier with stone coping in State Normal School grounds; brass tablet, marked "1571 T.".....	1,571.109
Bridge 115, base of rail.....	1,508.34
Bridge 115, surface of water.....	1,500.6
Trestle A, base of rail.....	1,503.56
Trestle A, surface of water.....	1,500.4
Ellensburg, 4,860 feet east of station, 350 feet west of milepost 128; copper nail on south end of west bulkhead cap of trestle.....	1,494.10
Milepost 129, near; copper nail on east bulkhead south side of trestle....	1,475.04
Holmes Spur, 40 feet west of switch stand.....	1,467.34
Milepost 130, 120 feet west of; copper nail on south side of east bulkhead cap of trestle 111.....	1,461.18
Trestle 110, base of rail.....	1,456.86
Trestle 109, base of rail.....	1,451.41
Milepost 131, 300 feet west of; copper nail on south side of cap of west bulkhead bent of trestle 108.....	1,446.89
Thrall siding, base of rail center of main line.....	1,441.77
Thrall siding, 300 feet northeast of warehouse; on iron wedge in milepost 132.....	1,432.60
Trestle 108, base of rail at.....	1,446.96
Trestle 107, base of rail at.....	1,442.22
Milepost Tacoma 133, Pasco J. 121; railroad spike on.....	1,423.06
Wilson Creek, trestle 105; base of rail.....	1,423.67
Wilson Creek, trestle 105; water surface.....	1,413.1
Yakima River, third crossing, 390 feet east of milepost Tacoma 134, Pasco J. 120; on north anchor bolt on west end of west span of bridge 104....	1,420.83
Bridge 104, center of, at base of rail.....	1,424.0
Yakima River, third crossing; water surface.....	1,398.0
Milepost 135, railroad spike on.....	1,406.72
Milepost 135, 1,800 feet east of; copper nail on north side of west bulkhead cap of trestle.....	1,398.15
Milepost 136, railroad spike on.....	1,390.29
Milepost 137, railroad spike on.....	1,376.60
Milepost 138, railroad spike on.....	1,363.28
Milepost 139, railroad spike on.....	1,354.27
Umtanum, 85 feet southwest of section house, 56 feet southwest of center of track; iron post, marked "1350 T.".....	1,349.885
Umtanum, top of rail in front of section house.....	1,348.76
Umtanum Creek, copper nail in bulkhead plank south corner of east end of trestle 102 over, 340 feet east of milepost 140.....	1,337.23
Milepost 141, railroad spike on.....	1,330.01
Milepost 142, railroad spike on.....	1,312.22
Milepost 143, railroad spike on.....	1,303.24
Milepost 144, railroad spike on.....	1,290.09
Milepost 145, railroad spike on.....	1,279.09
Milepost 146, railroad spike on.....	1,268.30
Milepost 147, railroad spike on.....	1,261.10
Milepost 148, railroad spike on.....	1,249.74
Roza, opposite station, 1 foot from fence, 198.3 feet west of center of telegraph office, $\frac{1}{4}$ mile east of milepost 148; iron post, marked "1249 T."..	1,249.274
Roza, in front of station; top of rail.....	1,249.13
Milepost 149, railroad spike on.....	1,238.57
Milepost 150, railroad spike on.....	1,234.90
Milepost 151, railroad spike on.....	1,220.88

	Feet.
Yakima River, second crossing, on seventh floor beam from east end of bridge over, on bolt stamped with T.....	1, 222. 85
Yakima River, second crossing, base of rail center of railroad bridge.....	1, 223. 46
Yakima River, second crossing; water surface.....	1, 192. 5
Milepost 152, railroad spike on.....	1, 206. 43
Milepost 153, railroad spike on.....	1, 186. 50
Milepost 154, railroad spike on.....	1, 172. 87
Milepost 155, railroad spike on.....	1, 164. 75
Selah, 1 mile west of; railroad spike on milepost 156.....	1, 146. 01
Selah, 2.6 feet southwest of west corner of fence around section house, 18 feet from center of main track; iron post, marked "1147 T.".....	1, 147. 305
Selah, $\frac{1}{4}$ mile east of; railroad spike on milepost 157.....	1, 145. 82
Selah, base of rail in front of section house.....	1, 148. 48
Milepost 158, ship spike on.....	1, 142. 19
Yakima River, first crossing, bridge 94; water surface.....	1, 114. 1
Yakima River, first crossing; base of rail center of railroad bridge.....	1, 146. 86
Milepost 159, railroad spike on.....	1, 113. 60
Bridge 93 over flume, base of rail center of.....	1, 140. 31
Milepost 160, railroad spike on.....	1, 102. 20
Milepost 161, railroad spike on.....	1, 089. 89
Milepost 162, railroad spike on.....	1, 097. 49
Natchess River, $5\frac{1}{2}$ miles east of Selah; base of rail on bridge over.....	1, 097. 12
Natchess River, bridge 89; surface of water.....	1, 075. 3
Natchess River, opposite where it empties into Yakima River, in center of west end of stone pier of railroad bridge; copper plug, marked "1090 T.".....	1, 089. 959
Milepost 163, railroad spike on.....	1, 096. 95
Canal, trestle 87; base of rail.....	1, 093. 21
Canal, trestle 87; surface of water.....	1, 081. 7
North Yakima, mill of Yakima Milling Company; surface of water in flume.....	1, 069. 2
North Yakima, opposite station; in pilaster of northwest corner of entrance to city hall building on Front street; aluminum tablet, marked "1067 T.".....	1, 056. 836
North Yakima, top of rail in front of depot.....	1, 066. 96
NORTH YAKIMA TO MARTON.	
Trestle 84, base of rail.....	1, 052. 01
Milepost 165, railroad spike on.....	1, 046. 35
Milepost 167, railroad spike on.....	993. 36
Yakima City, base of rail in front of telegraph office.....	979. 93
Yakima City, $\frac{1}{4}$ mile east of station; on 20-penny wire nail on signpost 168.....	971. 56
Ahtanum Creek, bridge No. 81, base of rail.....	952. 86
Yakima Indian Reservation, north boundary line of; bridge 81 of Ahtanum Creek; surface of water.....	940. 8
Milepost 169; on 20-penny wire nail in.....	952. 61
Yakima City, $\frac{1}{4}$ mile east of station; road crossing.....	958. 66
Yakima City, $1\frac{1}{4}$ miles east of; copper nail in north end of cap west bent of wagon-road bridge over Yakima River.....	949. 90
Yakima River, center of floor of west span of wagon bridge over.....	953. 23
Yakima River, surface of water under wagon bridge.....	934. 2
Milepost 170, railroad spike on.....	937. 68
Milepost 171, railroad spike on.....	928. 22
Fort Simcoe, 110 feet west of wagon road to; 100 feet south of intersection of Fort Simcoe and Toppenish roads, 125 feet east of main line of Northern Pacific Railway, $1\frac{1}{4}$ miles north of bridge over Yakima River, at corner of fence at cattle crossing; iron post, marked "937 T.".....	937. 342

	Feet.
Parker siding, base of rail opposite signboard	922.71
Milepost 172, railroad spike on	913.31
Yakima Indian Reservation, Irwin ditch, base of rail over canal	903.15
Yakima Indian Reservation, Irwin ditch; surface of water in canal	896.9
Milepost 173, railroad spike on	897.07
Milepost 174, railroad spike on	881.68
Milepost 175, railroad spike on	868.67
Simcoe station, 180 feet east of east end of depot at; 50.3 feet south of center of track, corner of fence; iron post, marked "855 T."	854.859
Simcoe, top of rail in front of station	858.85
Milepost 176, railroad spike on	852.68
Milepost 177, railroad spike on	836.72
Milepost 178, railroad spike on	824.07
Milepost 179, railroad spike on	809.28
Bridge No. 77, base of rail	813.16
Milepost 180, railroad spike on	796.20
Milepost 181, railroad spike on	783.74
Milepost 182, railroad spike on	770.70
Toppenish station, base of rail in front of depot	757.17
Toppenish station, 108 feet east from northeast corner of depot, 25 feet south from center of main track, near corner of fence; iron post, marked "755 T."	755.352
Milepost 184, railroad spike on	745.49
Milepost 185, railroad spike on	737.34
Bridge No. 73, near milepost 186; copper nail on cap on south end of east bulkhead	724.45
Bridge No. 74, base of rail	728.24
Milepost 187, railroad spike on	716.04
Road crossing, 30 feet south of center of road, 37 feet from center of track, 3 feet north of fifth post along west fence; iron post, marked "717 T."	716.726
Milepost 188, railroad spike on	716.86
Trestle No. 70, base of rail	715.15
Trestle No. 70, surface of water	706.1
Trestle No. 69, base of rail	713.16
Trestle No. 68, 420 feet west of milepost 189; copper nail on cap of second bent from east end on south side of cap of	709.12
Bridge No. 67, base of rail center of	711.33
Bridge No. 67, surface of water	700.3
Bridge No. 66, base of rail	711.36
Bridge No. 65, base of rail center of	707.48
Milepost 190, copper nail in south end of cap of east bulkhead bent of trestle No. 64	699.10
Milepost 191, railroad spike on	695.90
Bridge No. 60, base of rail center of	693.55
Bridge No. 60, surface of water	683.9
Milepost 192, railroad spike on	686.62
Bridge No. 59, base of rail center of	684.69
Bridge No. 59, surface of water	677.1
Bridge No. 57, opposite milepost 193; copper nail on south end of cap of east end of	675.75
Satas Creek, bridge No. 56, base of rail	676.70
Satas Creek, bridge No. 56; surface of water	667.5
Satas, 26 feet southwest of southwest corner of platform of station, 30 feet south of center of track, 2½ feet north of first telegraph pole south of station; iron post, marked "674 T."	674.176

TRIANGULATION AND SPIRIT LEVELING.

511

	Feet.
Milepost 194, railroad spike on	672.00
Bridge No. 55, base of rail	672.25
Satas, top of rail in front of station	675.50
Bridge No. 54, base of rail	673.32
Milepost 195, railroad spike on	683.41
Milepost 196, railroad spike on	686.90
Milepost 197, railroad spike on	690.01
Milepost 198, railroad spike on	713.72
Milepost 198, opposite, 9 feet north of fence, 116 feet south of center of track; iron post, marked "717 T."	716.588
Milepost 199, railroad spike on	706.60
Milepost 200, railroad spike on	719.58
Milepost 201, railroad spike on	708.68
Mabton, in front of telegraph office; top of rail	716.71
Mabton, at water tank 2 feet east of fence around railroad section house, 35 feet north of center of track, 40 feet west of center line of wagon road at crossing of railroad; iron post, marked "715 T."	715.372

MABTON TO KIONA.

Milepost 202, railroad spike on	716.13
Milepost 203, railroad spike on	713.51
Milepost 204, railroad spike on	704.47
Milepost 205, railroad spike on	704.18
Milepost 206, railroad spike on	708.03
Milepost 207, railroad spike on	693.21
Byron siding, 350 feet south of milepost 208, near signboard "Mabton 7 miles, Globe 9 miles, Bickerton 27 miles," 150 feet from center of track, 2 feet from corner of fence; iron post, marked "696 T."	696.463
Milepost 209, railroad spike on	685.63
Milepost 210, railroad spike on	668.67
Milepost 211, railroad spike on	667.25
Milepost 212, opposite; copper nail on east stanchion of extra rail post ...	662.92
Milepost 213, railroad spike on	655.79
Prosser, 540 feet west of station, in corner of fence of railroad reservation at Sixth street, in southwest corner of block B, lot 8; iron post, marked "661 T."	661.396
Milepost 214, railroad spike on	671.86
Milepost 215, railroad spike on	674.81
Milepost 217, railroad spike on	634.03
Milepost 218, railroad spike on	623.44
Milepost 219, railroad spike on	634.34
Gibben, 171 feet north of station platform, 150 feet north of center of main track, 2 feet south of wire fence; iron post, marked "627 T."	627.053
Milepost 221, railroad spike on	595.66
Milepost 222, railroad spike on	570.88
Milepost 223, railroad spike on	553.09
Bridge No. 28, copper nail on south end of cap on east end of	548.54
Milepost 224, railroad spike on	537.85
Chandler siding, 1.6 feet from southwest corner of fence around railroad section house at, 15 feet from center of main line; iron post, marked "534 T."	534.379
Milepost 225, railroad spike on	523.60
Milepost 226, railroad spike on	497.27
Milepost 227, railroad spike on	493.59
Milepost 228, railroad spike on	490.03

	Feet.
Milepost 229, railroad spike on	489.55
Kiona, 12 feet west of west end of platform, 12 feet south of main track, in east corner of fence around fruit orchard in small park on railroad reservation; iron post, marked "515 T."	514.789
Kiona, opposite center of station; base of rail	514.77

KIONA TO PASCO.

Milepost 231, railroad spike on	537.16
Bridge 18, center of; at base of rail	540.93
Milepost 232, railroad spike on	562.62
Milepost 233, railroad spike on	592.07
Milepost 234, railroad spike on	616.33
Milepost 235, 31 feet north of; iron post, marked "640 T."	640.287
Milepost 236, railroad spike on	668.10
Badger, in front of station; top of rail	681.42
Milepost 237, railroad spike on	678.69
Milepost 238, railroad spike on	664.58
Milepost 239, railroad spike on	634.66
Through cut, south end of, 3 feet east of telegraph pole, 120 feet southeast of milepost 240; iron post, marked "605 T."	604.970
Milepost 241, railroad spike on	572.00
Milepost 242, railroad spike on	568.68
Milepost 243, railroad spike on	539.65
Milepost 244, railroad spike on	543.06
Milepost 245, railroad spike on	552.65
Relief siding, 2 feet east of first telegraph pole southwest of signboard at, 920 feet west of milepost 246; iron post, marked "567 T."	566.831
Milepost 247, railroad spike on	520.44
Milepost 248, railroad spike on	479.14
Milepost 249, railroad spike on	437.64
Milepost 250, railroad spike on	396.33
Kennewick Canal, base of rail center of bridge over	392.93
Kennewick Canal, bottom of irrigation ditch	385.33
Milepost 251, railroad spike on	367.56
Kennewick, 95 feet southeast from southeast corner of station, 51 feet north of center of track, 1.7 feet west of corner of fence around section house; iron post, marked "362 T."	361.864
Kennewick, in front of station; top of rail	361.90
Milepost 252, railroad spike on	356.14
Columbia River, near Pasco; surface of water at railroad bridge	317.6
Columbia River, base of rail near draw span of railroad bridge over	358.57
Milepost 253, railroad spike on	366.40
Pasco, in northwest corner of brick roundhouse of Northern Pacific Rail- way Company, in center of third course of bricks above stone founda- tion; aluminum tablet, marked "378 T."	378.062
Pasco, in front of telegraph office; top of rail	381.36

PASCO TO CONNELL.

Pasco, 1 mile east of; railroad spike on milepost Wallula 16, Hope 230...	396.49
Milepost Wallula 17, Hope 229; railroad spike on	410.77
Milepost Wallula 18, Hope 228; railroad spike on	418.40
Milepost Wallula 19, Hope 227; railroad spike on	418.30
Milepost Wallula 20, Hope 226; railroad spike on	444.00
Milepost Wallula 20, Hope 226, 50 feet south of, 18 feet west of center of main track, 5 miles east of Pasco; iron post, marked "445 T."	444.953

	Feet.
Milepost Wallula 22, Hope 224; railroad spike on.....	490.18
Glade, opposite center of siding at; base of rail main line.....	492.35
Milepost Wallula 23, Hope 223; railroad spike on.....	496.44
Milepost Wallula 24, Hope 222; railroad spike on.....	519.21
Bridge 243, base of rail center of.....	521.68
Bridge 242; copper nail south end of cap, second bent from east end of...	535.91
Milepost Wallula 25, Hope 221, 90 feet southeast of, 3½ feet west of telegraph pole; iron post, marked 337 "T.".....	537.486
Milepost Wallula 26, Hope 220; railroad spike on.....	555.08
Milepost Wallula 27, Hope 219; railroad spike on.....	557.09
Milepost Wallula 28, Hope 218; railroad spike on.....	561.84
Trestle 240; copper nail on east end of cap, second bent from south end of.	561.28
Bridge 240, base of rail center of.....	563.13
Milepost Wallula 29, Hope 217; railroad spike on.....	567.55
Milepost Wallula 30, Hope 216, railroad spike on.....	575.68
Milepost Wallula 31, Hope 215, railroad spike on.....	581.68
Milepost Wallula 32, Hope 214, railroad spike on.....	588.59
Eltopia, 35 feet east of gate to section house, 33 feet from center of main track, 50 feet from tank house, 1.4 feet from fence; iron post, marked "591 T.".....	591.085
Eltopio, base of rail in front of water tank.....	590.82
Milepost Wallula 33, Hope 213, railroad spike on.....	596.82
Milepost Wallula 34, Hope 212, railroad spike on.....	606.16
Milepost Wallula 35, Hope 211, railroad spike on.....	631.46
Milepost Wallula 36, Hope 210, railroad spike on.....	630.27
Trestle 232, base of rail center of.....	636.14
Milepost Wallula 37, Hope 209, railroad spike on.....	645.65
Thorough cut, at south end of, 60 feet east of main line, 330 feet northeast of milepost Wallula 37, Hope 209, 5 feet north of telegraph post; iron post, marked "651".....	651.437
Milepost Wallula 38, Hope 208, railroad spike on.....	676.49
Milepost Wallula 39, Hope 207, railroad spike on.....	674.22
Milepost Wallula 40, Hope 206, railroad spike on.....	676.07
Milepost Wallula 41, Hope 205, railroad spike on.....	674.87
Lake, in front of section house; base of rail.....	677.18
Lake, in northwest corner of fence at section house, 40 feet east of center of track, 180 feet north of the watertank; iron post, marked "677 T."..	677.209
Milepost Wallula 42, Hope 204, railroad spike on.....	681.46
Trestle 221, center of, at base of rail.....	684.25
Milepost Wallula 43, Hope 203, railroad spike on.....	690.21
Trestle 219, center of, at base of rail.....	692.59
Milepost Wallula 44, Hope 202, railroad spike on.....	697.61
Trestle 218, center of, at base of rail.....	701.17
Milepost Wallula 45, Hope 201, railroad spike on.....	705.42
Lake, 4½ miles east of, 50 feet southeast of center of track, opposite Milepost Wallula 46, Hope 200, 4 feet southwest of telegraph pole; iron post, marked "715 T.".....	715.452
Trestle 217, center of, at base of rail.....	713.67
Trestle 216, center of, at base of rail.....	716.22
Milepost Wallula 47, Hope 199, railroad spike on.....	748.01
Bridge 215, center of, at base of rail.....	750.37
Bridge 214, center of, at base of rail.....	755.86
Milepost Wallula 49, Hope 197, railroad spike on.....	801.60
Trestle 212, center of, at base of rail.....	813.35
Milepost Wallula 50, Hope 196, railroad spike on.....	837.07

	Feet.
Connell station, 16 feet from northeast corner, between platform and telegraph pole 16 feet southeast from center of track; iron post, marked "838 T."	838.296
CONNELL TO RITZVILLE.	
Trestle 211, copper nail in east end of cap of middle bent of	838.76
Trestle 211, center of, at base of rail	840.80
Trestle 210, center of, at base of rail	849.18
Trestle 209, center of, at base of rail	851.81
Milepost Wallula 52, Hope 194, railroad spike on	851.75
Trestle 208, center of, at base of rail	857.41
Trestle 207, center of, at base of rail	858.19
Trestle 206, center of, at base of rail	858.88
Trestle 205, center of, at base of rail	863.83
Trestle 204, center of, at base of rail	867.70
Milepost Wallula 53, Hope 193, railroad spike on	864.54
Trestle 203, center of, at base of rail	874.01
Trestle 202, center of, at base of rail	877.58
Trestle 201, center of, at base of rail	882.64
Trestle 200, center of, at base of rail	885.59
Trestle 199, center of, at base of rail	887.45
Trestle 198, center of, at base of rail	897.83
Trestle 199, 8 feet south of milepost Wallula 54, Hope 192, copper nail on north end of cap on west end of	885.65
Trestle 197, copper nail on west end of cap of west end of	903.37
Trestle 194, 100 feet south of west end of; 12 feet north of telegraph pole, 400 feet northeast of milepost Wallula 55, Hope 191, 50 feet south of center of track; iron post, marked "924 T."	924.304
Milepost Wallula 56, Hope 190, railroad spike on	941.36
Bridge 197, center of, at base of rail	904.96
Bridge 196, center of, at base of rail	907.10
Bridge 195, center of, at base of rail	916.22
Bridge 194, center of, at base of rail	924.27
Bridge 193, center of, at base of rail	929.12
Bridge 192, center of, at base of rail	938.10
Bridge 191, center of, at base of rail	941.77
Bridge 190, center of, at base of rail	949.45
Bridge 189, center of, at base of rail	960.73
Bridge 188, center of, at base of rail	966.03
Bridge 187, center of, at base of rail	973.80
Bridge 186, center of, at base of rail	981.04
Bridge 185, center of, at base of rail	986.37
Milepost Wallula 57, Hope 189, railroad spike on	974.91
Trestle 184, center of, at base of rail	992.49
Trestle 183, center of, at base of rail	993.13
Milepost Wallula 58, Hope 188, railroad spike on	996.26
Milepost Wallula 59, Hope 187, railroad spike on	1,028.14
Hatton, near corner of fence east of schoolhouse, near center line of sec. 20, T. 15 N., R. 31 E., 100 feet west of center of track; iron post, marked "1077 T."	1,077.463
Milepost Wallula 60, Hope 186, railroad spike on	1,066.37
Trestle 173, center of, at base of rail	1,051.31
Trestle 172, center of, at base of rail	1,054.61
Hatton, top of rail in front of telegraph office	1,064.07
Milepost Wallula 61, Hope 185, railroad spike on	1,100.49

	Feet.
Trestle 171, center of, at base of rail	1,083.52
Trestle 170, center of, at base of rail.....	1,091.84
Trestle 169, center of, at base of rail.....	1,099.08
Milepost Wallula 62, Hope 185, railroad spike on.....	1,130.18
Trestle 168, center of, at base of rail.....	1,102.05
Trestle 167, center of, at base of rail.....	1,114.97
Trestle 166, center of, at base of rail.....	1,124.35
Trestle 165, center of, at base of rail.....	1,131.63
Trestle 164, center of, at base of rail.....	1,139.01
Trestle 163, center of, at base of rail.....	1,145.15
Trestle 162, center of, at base of rail.....	1,151.37
Scott station, 50 feet northeast from north corner, 2½ feet north of telegraph pole near pump house, 50 feet east of center of main track; iron post, marked "1167 T."	1,166.500
Milepost Wallula 63, Hope 183, railroad spike on	1,162.46
Scott, in front of telegraph office, top of south rail.....	1,166.63
Trestle 161, center of, at base of rail.....	1,169.35
Milepost Wallula 64, Hope 182, railroad spike on	1,195.86
Milepost Wallula 65, Hope 181, railroad spike on	1,243.83
Trestle 158, center of, at base of rail.....	1,276.80
Trestle 158, copper nail on north end of cap second bent west of east end of	1,275.53
Milepost Wallula 66, Hope 180, railroad spike on	1,289.02
Trestle 157, center of, at base of rail.....	1,297.27
Milepost Wallula 67, Hope 179, railroad spike on	1,342.08
Milepost Wallula 68, Hope 178, 47 feet southeast of; near east line of railroad fence at road crossing, 60 feet east of center line of crossing, 33 feet east of center of main track; iron post, marked "1394 T."	1,393.651
Milepost Wallula 69, Hope 177, railroad spike on	1,438.64
Milepost Wallula 70, Hope 176, railroad spike on	1,491.55
Milepost Wallula 71, Hope 175, railroad spike on	1,540.11
Providence, base of rail in front of section house.....	1,537.54
Milepost Wallula 72, Hope 174, railroad spike on	1,513.87
Milepost Wallula 73, Hope 173, railroad spike on	1,485.95
Milepost Wallula 73, Hope 173, 1,920 feet northeast of; 50 feet east of center of track, 10 feet north of telegraph pole at Farm crossing; iron post, marked "1478 T."	1,476.264
Milepost Wallula 74, Hope 172, railroad spike on	1,455.71
Milepost Wallula 75, Hope 171, railroad spike on	1,427.09
Milepost Wallula 76, Hope 170, railroad spike on	1,394.71
Milepost Wallula 77, Hope 169, railroad spike on	1,362.79
Trestle 138, copper nail on north end of cap of second bent from west end of	1,331.91
Trestle 138, center of, at base of rail	1,333.79
Trestle 140, center of, at base of rail	1,353.32
Lind station, 28 feet from northwest side of tank house, in northeast corner of fence around and 50 feet east of corner of telegraph office, 21 feet northwest of center of track; iron post, marked "1362 T."	1,362.493
Trestle 137, center of, at base of rail	1,362.06
Trestle 136, center of, at base of rail	1,370.67
Milepost Wallula 80, Hope 166, railroad spike on	1,370.99
Milepost Wallula 81, Hope 165, railroad spike on	1,399.05
Trestle 135, center of, at base of rail	1,400.51
Milepost Wallula 82, Hope 164, railroad spike on	1,415.26
Milepost Wallula 83, Hope 163, railroad spike on	1,444.98

	Feet.
Trestle 134, center of, at base of rail	1, 453.52
Trestle 132, center of, at base of rail	1, 495.93
Trestle 133, center of, at base of rail	1, 489.01
Milepost Wallula 85, Hope 161, $\frac{1}{4}$ mile west of; 100 feet north of railroad track, 50 feet north of railroad fence, 40 feet north of center of wagon road; iron post, marked "1507 T."	1, 507.319
Milepost Wallula 85, Hope 161, railroad spike on	1, 511.51
Milepost Wallula 86, Hope 160, copper nail in top of north stanchion of extra rail post opposite	1, 545.70
Paha station, + cut on rock under west stanchion of water tank at	1, 563.89
Paha station, base of rail at	1, 563.69
Milepost Wallula 87, Hope 159, railroad spike on	1, 576.16
Milepost Wallula 88, Hope 158, railroad spike on	1, 601.85
Milepost Wallula 157, 360 feet west of; base of rail trestle	1, 623.90
Milepost Wallula 89, Hope 157, copper nail on notch on side of	1, 625.25
Milepost Wallula 90, Hope 156, opposite; iron post, marked "1645 T."	1, 645.074
Milepost Wallula 91, Hope 155, copper nail on	1, 664.50
Milepost Wallula 92, Hope 154, 400 feet west of; road crossing	1, 696.45
Milepost Wallula 92, Hope 154, railroad spike on	1, 699.92

RITZVILLE TO SPRAGUE.

Ritzville, $1\frac{1}{4}$ miles south of; 4 feet north of telegraph pole, 150 feet south-east of milepost Wallula 95, Hope 151, 42 feet east of center of track; iron post, marked "1798 T."	1, 797.508
Ritzville, in fifth row of bricks above stone foundation at north entrance to Adams County court-house; aluminum tablet, marked "1820 T."	1, 820.053
Ritzville, top of rail in front of station	1, 813.96
Milepost Wallula 97, Hope 149, railroad spike on	1, 815.15
Milepost Wallula 98, Hope 148, railroad spike on	1, 832.24
Milepost Wallula 99, Hope 147, railroad spike on	1, 850.27
Ritzville, 4 miles east of; 45 feet north west of milepost Wallula 100, Hope 146, 50 feet north of center of track, 0.4 foot west of telegraph pole; iron post, marked "1848 T."	1, 848.497
Milepost Wallula 101, Hope 145, railroad spike on	1, 856.37
Milepost Wallula 102, Hope 144, 20-penny wire nail on	1, 888.06
Small Thorough Cut, 400 feet east of, $\frac{1}{4}$ mile east of milepost Wallula 103, Hope 143, opposite house; railroad spike on telegraph pole	1, 927.31
Iona, 2 feet east of railroad fence at, 123 feet north of center of track, 145 feet from north front of warehouse, 300 feet northwest of milepost Wallula 104, Hope 142; iron post, marked "1944 T."	1, 943.503
Iona, east head block of switch	1, 942.7
Milepost Wallula 105, Hope 141, railroad spike on	1, 935.87
Milepost Wallula 106, Hope 140, railroad spike on	1, 937.86
Milepost Wallula 107, Hope 139, railroad spike on	1, 923.35
Milepost Wallula 108, Hope 138, railroad spike on telegraph pole opposite ..	1, 925.40
Milepost Wallula 109, Hope 137, railroad spike on	1, 926.64
Harriston siding, at west end of; head block of switch	1, 927.72
Harriston, 30 feet west of southwest corner of railroad section house, 50 feet north of center of track, 4 feet west of telegraph pole, 6 miles east of Iona; iron post, marked "1937 T."	1, 936.549
Harriston, top of rail in front of section house	1, 936.70
Milepost Wallula 111, Hope 135, railroad spike on	1, 916.03
Milepost Wallula 112, Hope 134, railroad spike on	1, 908.76
Milepost Wallula 113, Hope 133, railroad spike on	1, 903.15
Milepost Wallula 114, Hope 132, railroad spike on	1, 894.72

	Feet.
Sprague Lake, water surface	1,879.8
Milepost Wallula 115, Hope 131, railroad spike on	1,890.19
Harriston, 5.6 miles east of, 40 feet north of center of track, 7 feet west of telegraph pole, 60 feet south of railroad fence, and 100 feet west of cattle guard where cattle cross under trestle to Sprague Lake; iron post, marked "1897 T."	1,896.986
Milepost Wallula 116, Hope 130, railroad spike on	1,892.90
Milepost Wallula 117, Hope 129, railroad spike on	1,886.82
Milepost Wallula 118, Hope 128, spike on	1,890.65
Bridge 108, copper nail in south end of cap of east bent of	1,888.73
Bridge 108, center of, at base of rail	1,890.54
Milepost Wallula 119, Hope 127; railroad spike on	1,895.34
Trestle near B street, center of, at base of rail	1,896.61
Sprague, in brick wall of Grey's store, northeast corner of First and C streets, ninth tier of bricks above sidewalk; aluminum tablet, marked "1899 T."	1,898.677
Sprague, top of rail in front of station	1,898.54

SPRAGUE TO CHENEY.

Sprague, 1 mile east of, 50 feet north of center of track, 4 feet west of telegraph pole at road crossing; iron post, marked "1936 T."	1,936.383
Bridge 102, base of rail, center of	1,949.55
Milepost Wallula 121, Hope 125, railroad spike on	1,954.75
Milepost Wallula 122, Hope 124, railroad spike on	2,004.71
Base of rail trestle 6 feet wide	2,047.08
Milepost Wallula 123, Hope 123, railroad spike on	2,052.83
Milepost Wallula 124, Hope 122, railroad spike on	2,080.65
Milepost Wallula 125, Hope 121, Railroad spike on	2,087.07
Railroad bridge 99, base of rail, center of	2,106.69
Railroad bridge 98, base of rail, center of	2,108.67
Bridge 98, southeast end of, about 90 feet east of milepost Wallula 126, Hope 120; copper nail on bulkhead timber	2,108.05
Kline, base of rail in front of section house at	2,112.15
Kline, east head of block siding at	2,153.55
Milepost Wallula 127, Hope 119, 60 feet northeast of, 50 feet north of center of track, 6 feet southwest of telegraph pole, 50 feet west of east switch stand, iron post, marked "2147 T."	2,147.159
Milepost Wallula 128, Hope 118, railroad spike on	2,206.78
Bridge 95, base of rail, center of	2,217.36
Bridge 95, on top of drift bolt south end of cap of east bulkhead bent	2,216.38
Milepost Wallula 129, Hope 117, railroad spike on	2,256.23
Milepost Wallula 130, Hope 116, railroad spike on	2,271.69
Milepost Wallula 131, Hope 115, railroad spike on	2,272.76
Tyler, 1½ miles west of, 60 feet north of milepost Wallula 132, Hope 114, 30 feet west of center of track; iron post, marked "2272 T."	2,271.621
Milepost 133, Hope 113, railroad spike on	2,291.82
Tyler, base of rail in front of telegraph office	2,291.13
Milepost Wallula 134, Hope 112, on railroad spike on first telegraph pole west of, 40 feet from center of track	2,285.68
Milepost Wallula 135, Hope 111, railroad spike on	2,277.22
Milepost Wallula 136, Hope 110, railroad spike on	2,257.39
Milepost Wallula 137, Hope 109, 20 feet from, 28 feet from center of track, 4.8 feet east of telegraph pole; iron post, marked "2284 T."	2,283.817
Trestle 94, copper nail on south end of cap of west bent of	2,255.54
Milepost Wallula 137, Hope 109, railroad spike on	2,283.99

	Feet.
Bridge 93, center of, at base of rail	2, 296. 54
Trestle 92, copper nail in south end of cap at east end of	2, 300. 64
Trestle 92, center of, at base of rail	2, 303. 33
Trestle 91, 60 feet east of milepost Wallula 138, Hope 108, copper nail on south end of cap of east end of	2, 310. 20
Bridge 91, center of, at base of rail	2, 312. 52
Milepost Wallula 139, Hope 107, railroad spike on	2, 332. 12
Milepost Wallula 140, Hope 106, railroad spike on	2, 339. 66
Milepost Wallula 141, Hope 105, railroad spike on	2, 348. 56
Milepost Wallula 142, Hope 104, railroad spike on	2, 353. 23
Milepost Wallula 142, Hope 104, 390 feet northeast of, 40 feet south of center of track; iron post, marked "2353 T."	2, 352. 593
Milepost Wallula 143, Hope 103, railroad spike on	2, 354. 16
Milepost Wallula 144, Hope 102	2, 346. 48
Cheney, top of rail at station	2, 334. 98
Cheney, in northeast corner of First National Bank building, corner of Main and D streets, in top of eighth row of bricks above sidewalk; aluminum tablet, marked "2351 T."	2, 351. 436
Cheney, on right hand side of portico entrance to Washington State Normal School, in eighth tier of brick above tile floor and 16 feet east of corner of wall; aluminum tablet, marked "2432 T."	2, 431. 639

CHENEY TO SPOKANE.

Milepost Wallula 145, Hope 101, railroad spike on	2, 327. 21
Trestle 86, base of rail center of	2, 325. 70
At junction of Y of Washington Central Branch Railroad and Northern Pacific Railway	2, 321. 71
Trestle 84, base of rail center of	2, 313. 59
Milepost Wallula 146, Hope 100, railroad spike on	2, 304. 31
Milepost Wallula 147, Hope 99, railroad spike on	2, 280. 81
Trestle No. 79, copper nail on north end of cap of second bent from west end of	2, 251. 35
Trestle 79, base of rail center of	2, 249. 19
Milepost Wallula 148, Hope 98, railroad spike on	2, 231. 49
Trestle 77, base of rail center of	2, 212. 95
Cheney, 4½ miles east of, 35 west of center of track, 5 feet north of telegraph pole, 60 feet southwest of road crossing; iron post, marked "2195 T."	2, 195. 367
Milepost Wallula 149, Hope 97, railroad spike on	2, 184. 63
Bridge 76, center of, at base of rail	2, 178. 94
Bridge 75, base of rail center of	2, 168. 78
Bridge 75, surface of water under	2, 161. 9
Milepost Wallula 150, Hope 96, railroad spike on	2, 142. 32
Trestle 74, base of rail center of	2, 144. 10
Milepost Wallula 151, Hope 95, railroad spike on	2, 140. 68
Trestle 70, base of rail center of	2, 130. 91
Marshal Junction, 100 feet northwest of railroad crossing and 100 east of post-office building; iron post, marked "2130 T."	2, 130. 047
Milepost Wallula 153, Hope 93, railroad spike on	2, 072. 97
Milepost Wallula 154, Hope 92, railroad spike on	2, 013. 87
Milepost Wallula 155, Hope 91, railroad spike on	1, 958. 16
Trestle 67, center of, at base of rail	1, 957. 74
Trestle 67, surface of water under	1, 949
Trestle 65, center of, at base of rail	1, 921. 64
Trestle 65, surface of water under	1, 907. 5

	Feet.
Trestle 64, center of, at base of rail	1,914.81
Trestle 63, center of, at base of rail	1,912.15
Trestle 63, surface of water under	1,893
Trestle 62, center of, at base of rail	1,907.06
Milepost Wallula 156, Hope 90, railroad spike on	1,903.98
Trestle 60, center of, at base of rail	1,872.10
Milepost Wallula 157, Hope 89, 660 feet south of, 48 feet west of center of track, 2 feet south of fence, 90 feet southwest of cattle guard; iron post, marked "1857 T."	1,857.349
Trestle 59, base of rail 80 feet east of west end of	1,820.71
Hangman Creek, base of rail at west end of Howe truss span of railroad bridge 59	1,820.48
Hangman Creek, surface of water	1,773.7
Milepost Wallula 158, Hope 88, 45 feet northeast of; railroad spike on pine tree 18 inches in diameter	1,817.88
Trestle 56, center of, at base of rail	1,864.89
Trestle 53, copper nail on south end of cap third bent from west end of ...	1,886.42
Bridge 53, base of rail	1,888.54
Spokane, $\frac{1}{2}$ mile west of station, 300 feet east of crossing of Maple street; railroad spike on milepost Wallula 160, Hope 86	1,900.85
Spokane, 120 feet northwest of passenger station and 15 feet north of switch; spike in telegraph pole	1,907.42
Spokane, top of rail at station	1,909.37
Spokane, Washington street, south end of straining beam span of bridge over	1,882.66
Spokane, top of rail, Great Northern station	1,879.90
Spokane, 130 feet west of Great Northern Railway station; railroad spike on telegraph pole	1,877.50
Spokane, center of astronomic pier in court-house grounds; aluminum tablet, marked "1891 T."	1,890.972
Spokane, in southeast corner of brick wall of station, in second course of brick above stone foundation, 4th row west from corner; bronze tablet, marked "1914 T."	1,913.628
Spokane, where electric cars cross Sprague avenue; top of rail	1,913.86

SPOKANE TO MISSOULA.

Milepost W. 162, H. 84, railroad spike on	1,906.07
Trestle 49, base of rail center of	1,905.28
Spokane, $1\frac{1}{4}$ miles east of, top of tie at junction of Northern Pacific with Oregon Railroad and Navigation Company's track	1,914.66
Milepost W. 163, H. 83, railroad spike on	1,929.33
Milepost W. 164, H. 82, railroad spike on	1,952.71
Milepost W. 165, H. 81, boat spike on	1,946.69
Milepost W. 166, H. 80, railroad spike on	1,952.11
Milepost W. 166, H. 80, 60 feet northwest of, 40 feet north of railroad; iron post, marked "1953 T."	1,952.856
Milepost W. 167, H. 79, railroad spike on	1,968.99
Milepost W. 168, H. 78, railroad spike on	1,975.53
Milepost W. 169, H. 77, railroad spike on	1,893.14
Trent Station, road crossing	1,988.8
Spokane River, base of rail at center of bridge 47	1,984.70
Spokane River, surface of water	1,916.7
Milepost W. 170, H. 76, railroad spike on	1,986.63
Milepost W. 171, H. 75, railroad spike on	2,025.24

	Feet.
Trent, 2 miles east of, 100 feet north of railroad at road crossing; iron post, marked "2041 T."	2, 041.323
Milepost W. 173, H. 73, railroad spike on	2, 041.97
Milepost W. 174, H. 72, railroad spike on	2, 061.50
Otis siding, 1 mile west of, at sign board at road crossing	2, 062.64
Otis siding, railroad spike on telegraph pole near road crossing	2, 075.28
Otis siding, $\frac{1}{4}$ mile east of, at northwest corner of fence at road crossing, 50 feet north of center of track; iron post, marked "2083 T."	2, 082.758
Milepost W. 176, H. 70, railroad spike on	2, 085.78
Milepost W. 117, H. 69, railroad spike on	2, 056.01
Milepost W. 178, H. 68, railroad spike on	2, 078.89
Milepost W. 179, H. 67, railroad spike on	2, 104.04
Washington and Idaho State line, 0.3 mile west of, 200 feet north of railroad crossing; iron post, stamped "2112 T."	2, 111.620
Milepost W. 180, H. 66, railroad spike on	2, 136.63
Milepost W. 181, H. 65, railroad spike on	2, 131.20
Hauser Junction, center of track in front of depot	2, 131.32
Milepost W. 182, H. 64, 60 feet east of; copper nail on south end of west bent of cap of trestle 43	2, 117.12
Hauser Junction, 1.4 miles east of, in south end of boulder 40 by 30 inches above surface, 30 feet north of public road and 120 feet north of railroad; bronze tablet, marked "2118 T."	2, 118.433
Milepost W. 183, H. 63, opposite; spike on telegraph pole north of railroad ..	2, 122.96
Wood spur, on telegraph pole opposite east switch stand	2, 136.54
Milepost W. 184, H. 62, 1,080 feet east of, 40 feet north of railroad; railroad spike on telegraph pole near schoolhouse	2, 144.57
Trestle 41, base of rail	2, 156.37
Milepost W. 185, H. 61, 690 feet east of, 40 feet north of railroad; railroad spike on telegraph pole	2, 157.07
Rathdrum, 1 mile west of, 60 feet north of center of track at road crossing; railroad spike on telegraph pole	2, 178.09
Trestle 40, base of rail	2, 181.88
Trestle 39, base of rail	2, 187.83
Trestle 39, surface of water	2, 179.8
Trestle 38, base of rail	2, 195.13
Trestle 38, surface of water	2, 183.6
Trestle 37, base of rail	2, 197.51
Rathdrum, top of rail at station	2, 206.35
Rathdrum, in brick building (Russell's store) eighth tier of bricks above sidewalk; bronze tablet marked, "2216 T."	2, 215.634
Milepost W. 189, H. 57, 210 feet east of, 50 feet north of track; railroad spike on telegraph pole	2, 255.71
Milepost W. 190, H. 56, 0.2 mile east of, 10 feet south of wagon road, 300 feet northeast of signboard "Sheridan;" copper nail in notch of fir tree 18 inches in diameter	2, 271.25
Sheridan, east head block of switch	2, 274.34
Milepost W. 192, H. 54, railroad spike on	2, 311.60
Milepost W. 193, H. 53, railroad spike on	2, 311.85
Ramsey siding, 50 feet north of center of track, 3 feet east of telegraph pole, 20 feet east of wagon road; iron post, marked "2330 T."	2, 330.212
Ramsey siding, top of rail in front of mail crane	2, 330.37
Milepost W. 194, H. 52, railroad spike on	2, 328.98
Milepost W. 195, H. 51, railroad spike on	2, 340.46
Milepost W. 196, H. 50, 215 feet northeast of, 100 feet north of railroad; copper nail on pine tree	2, 368.20

	Feet.
Milepost W. 197, H. 49, railroad spike on	2, 384. 48
North Pole Spur, $\frac{1}{4}$ mile east of, 40 feet north of railroad track, 3 feet east of telegraph pole; iron post, marked "2396 T."	2, 395. 663
Milepost W. 199, H. 47, railroad spike on	2, 389. 45
Fir stump 100 feet north of railroad, 10-penny cut nail on top of, used by railroad as bench mark, and marked "2396.08"	2, 387. 25
Milepost W. 201, H. 45, 390 feet northeast of, 40 feet north of track; railroad spike in north side of fir stump 24 inches in diameter	2, 376. 40
Athol, center of track in front of railroad section house	2, 391. 50
Athol, 200 feet northeast of milepost W. 202, H. 44; copper nail in notch of fir tree 24 inches in diameter	2, 392. 90
Milepost W. 203, H. 43, railroad spike on	2, 374. 85
Milepost W. 204, H. 42, railroad spike on	2, 349. 45
Milepost W. 204, H. 42, 13 feet west of; 20 feet west of center of track; iron post, marked "2350 T."	2, 350. 047
Milepost W. 205, H. 41, shoe rail on signboards on	2, 330. 82
Milepost W. 206, H. 40, railroad spike on	2, 301. 69
Milepost W. 207, H. 39, railroad spike on	2, 276. 89
Hoodoo Lake, base of rail center of bridge over	2, 262. 06
Granite, top of rail at station	2, 260. 28
Granite, 45 feet west of west edge of station platform, 20 feet south of center of track near telegraph pole; iron post, marked "2262 T."	2, 262. 222
Milepost W. 209, H. 37, railroad spike on	2, 267. 99
Milepost W. 210, H. 36, railroad spike on	2, 287. 95
Milepost W. 211, H. 35, railroad spike on	2, 278. 21
Trestle 28, base of rail center of	2, 266. 84
Trestle 28, water surface under	2, 260. 1
Milepost W. 212, H. 34, railroad spike on	2, 264. 90
Milepost W. 213, H. 33, nail on top of	2, 256. 03
Milepost W. 213, H. 33, 19 feet west of, 28 feet west of center of track; iron post, marked "2251 T."	2, 250. 856
Trestle 26, base of rail center of	2, 250. 89
Trestle 26, surface of water under	2, 242. 6
Milepost W. 214, H. 32, nail on top of	2, 235. 46
Milepost W. 214, H. 32, railroad spike on	2, 231. 87
Milepost W. 215, H. 31, railroad spike on	2, 225. 98
Trestle 24, base of rail center of	2, 223. 47
Milepost W. 216, H. 30, railroad spike on	2, 221. 59
Trestle 23, base of rail center of	2, 219. 95
Trestle 23, surface of water under	2, 210. 9
Cocolalla, base of rail in front of section house	2, 219. 93
Milepost W. 217, H. 29, railroad spike on	2, 215. 69
Milepost W. 218, H. 28, 250 feet northeast of, 18 feet north of railroad, southeast of whistling post; iron post, marked "2226 T."	2, 226. 083
Milepost W. 218, H. 28, nail on top of	2, 227. 82
Milepost W. 219, H. 27, railroad spike on	2, 225. 33
Milepost W. 220, H. 26, railroad spike on	2, 244. 50
Milepost W. 221, H. 25, railroad spike on	2, 219. 97
Milepost W. 222, H. 24, railroad spike on	2, 192. 81
Milepost W. 223, H. 23, railroad spike on	2, 183. 06
Algoma siding, east head block	2, 177. 13
Milepost W. 224, H. 22, 390 feet southeast of, 25 feet south of railroad track at west end of Thorough Cut; iron post, marked "2167 T."	2, 167. 013
Milepost W. 224, H. 32, nail on top of	2, 170. 66
Milepost W. 225, H. 21, 20 feet west of; railroad spike on whistling post	2, 142. 41

	Feet.
Milepost W. 226, H. 20, railroad spike on	2, 119.38
Milepost W. 227, H. 19, railroad spike on	2, 095.91
Milepost W. 228, H. 18, railroad spike on	2, 078.46
Lake Pend Oreille, on northwest guard rail of bridge No. 13, over, 300 feet south of draw span	2, 079.16
Lake Pend d'Oreille, center of draw span of bridge over	2, 078.74
Sand Point, top of rail center of depot	2, 086.15
Sand Point, 90 feet east of center of station, 3½ feet east of telegraph pole, 15 feet south of main track; iron post, marked "2087 T."	2, 087.248
Sand Point Creek, surface of water	2, 051.2
Sand Point Creek, top of hand rail on east side of wagon-road bridge	2, 082.18
Sand Point on Great Northern Railway, 32 feet northeast of section house; iron post, marked "2117 T."	2, 117.31
Sand Point, top of rail in front of telegraph office of Great Northern Railway	2, 119.34
Milepost W. 231, H. 15, railroad spike on	2, 109.76
Bridge 12, base of rail	2, 109.74
Bridge 11, base of rail	2, 110.93
Milepost W. 232, H. 14, railroad spike on	2, 117.74
Trestle 10, base of rail center of	2, 117.76
Trestle 10, surface of water under center of	2, 079.5
Trestle 10, bolt on northeast end of guard rail	2, 118.23
Trestle 9, base of rail center of	2, 118.98
Trestle 9, water surface under center of	2, 093.7
Milepost W. 233, H. 13, railroad spike on	2, 118.24
Trestle 8, base of rail center of	2, 115.33
Trestle 8, surface of water under center of	2, 072.3
Milepost W. 234, H. 12, railroad spike on	2, 115.46
Trestle 7, base of rail center of	2, 115.59
Trestle 7, surface of water under center of	2, 056.0
Kootenai, 60 feet north of post-office door; iron post, marked "2117 T." ..	2, 116.716
Kootenai siding; road crossing	2, 117.4
Milepost W. 235, H. 11, railroad spike on	2, 121.98
Milepost W. 236, H. 10, nail on top of	2, 111.62
Trestle 6, base of rail center of	2, 108.22
Trestle 6, water surface under center of	2, 080.2
Trestle 5, base of rail center of	2, 076.69
Trestle 5, water surface under center of	2, 062.7
Milepost W. 237, H. 9, 672 feet east of, 20 feet south of center of track at Oden siding; railroad spike on fir stump 15 inches in diameter	2, 072.21
Oden siding; east head block	2, 075.16
Trestle 4, base of rail center of	2, 076.51
Trestle 4, water surface under center of	2, 055.4
Milepost W. 238, H. 8, railroad spike on	2, 074.19
Trestle 3, base of rail center of	2, 076.72
Milepost W. 239, H. 7, railroad spike on	2, 076.76
Milepost W. 240, H. 6, on knoll 300 feet east of, 30 feet south of center of track; iron post, marked "2079 T."	2, 078.887
Milepost W. 241, H. 5, opposite; copper nail on east end of extra rail stanchion	2, 077.77
Pack River siding, top of rail in front of section house	2, 078.23
Pack River bridge; base of rail	2, 077.95
Pack River bridge; water surface	2, 050.5
Milepost W. 242, H. 4, opposite; bolt end on south end of guard rail	2, 079.15
Milepost W. 243, H. 3, railroad spike on	2, 080.18

	Feet.
Milepost W. 244, H. 2, railroad spike on	2, 076. 70
Milepost W. 245, H. 1, railroad spike on	2, 076. 95
Hope, top of rail opposite telegraph office	2, 078. 28
Hope, 70 feet west of station, in lot between hotel and station, 20 feet north of center of track; iron post, marked "2080 T."	2, 079. 772
Ellisport; road crossing	2, 086. 5
Strong Creek, base of rail center of trestle over	2, 086. 72
Strong Creek, surface of water under center of trestle over	2, 080. 3
Milepost H. 1, HLNA. 297, railroad spike on	2, 091. 10
Trestle 318, base of rail center of	2, 120. 70
Trestle 318, water surface under center of	2, 089. 2
Trestle 317, base of rail center of	2, 127. 32
Trestle 316, base of rail center of	2, 135. 50
Trestle 316, water surface under center of	2, 117. 1
Trestle 315, base of rail center of	2, 151. 54
Trestle 314, base of rail center of	2, 151. 18
Trestle 314, surface of water under center of	2, 128. 2
Milepost H. 4, HLNA. 294, railroad spike on	2, 133. 77
Thornton, 225 feet southeast of east end of siding, 45 feet south of track at east end of thorough cut; iron post, marked "2103 T."	2, 102. 674
Milepost H. 5, HLNA. 293, railroad spike on	2, 080. 61
Milepost H. 6, HLNA. 292, railroad spike on	2, 076. 44
Trestle 313, base of rail center of	2, 075. 78
Trestle 313, water surface under center of	2, 063. 2
Milepost H. 7, HLNA. 291, railroad spike on	2, 074. 91
Milepost H. 8, HLNA. 290, 360 feet east of; head of driftbolt on north cap of third bent from west end of trestle 310	2, 074. 01
Trestle 310, base of rail center of	2, 075. 95
Trestle 310, water surface under center of	2, 055. 5
Trestle 307, base of rail center of	2, 078. 36
Trestle 307, water surface under center of	2, 068. 8
Milepost H. 9, HLNA. 289, railroad spike on	2, 079. 04
Trestle 306, base of rail center of	2, 081. 41
Trestle 306, water surface under center of	2, 070. 9
Trestle 305, base of rail center of	2, 084. 98
Trestle 305, water surface under center of	2, 073. 6
Trestle 304, base of rail center of	2, 087. 70
Lightning Creek; base of rail center of steel bridge	2, 091. 61
Lightning Creek; water surface	2, 081. 6
Trestle 302, base of rail center of	2, 087. 53
Clark Fork, 150 feet east of station; road crossing	2, 083. 6
Clark Fork, 90 feet east of milepost H. 10, HLNA. 288, at east corner of fence of railroad section house; iron post, marked "2081 T."	2, 081. 341
Trestle 301, base of rail center of	2, 081. 98
Trestle 301, water surface under center of	2, 070. 5
Clark Fork; second crossing, base of rail at center of bridge 300	2, 091. 95
Clark Fork; water surface	2, 062. 7
Milepost Hope 11, HLNA. 287, railroad spike on	2, 087. 28
Milepost H. 12, HLNA. 286, railroad spike on	2, 084. 80
Milepost H. 13, HLNA. 285, railroad spike on	2, 087. 57
Milepost H. 14, HLNA. 284, railroad spike on	2, 089. 26
Trestle 299, base of rail center of	2, 090. 22
Trestle 299, water surface under center of	2, 070. 4
Trestle 298, base of rail center of	2, 092. 16

	Feet.
Milepost H. 15, HLNA. 283, $\frac{1}{2}$ mile east of, 15 feet north of railroad track opposite spur for loading logs; iron post, marked "2101 T.".....	2, 100. 663
Milepost H. 16, HLNA. 282, railroad spike on.....	2, 127. 69
Trestle 297, base of rail center of.....	2, 145. 15
Cabinet; top of rail in front of section house	2, 186. 61
Idaho-Montana boundary line, at signboard 15 feet north of track; iron post, marked "2212 T.".....	2, 212. 478
Milepost H. 19, HLNA. 279, railroad spike on.....	2, 237. 15
Milepost H. 20, HLNA. 278, railroad spike on.....	2, 238. 17
Milepost H. 21, HLNA. 277, railroad spike on.....	2, 237. 83
Milepost H. 22, HLNA. 276, railroad spike on	2, 238. 49
Milepost H. 23, HLNA. 275, railroad spike on.....	2, 252. 24
Heron; top of rail at station	2, 256. 21
Heron, 150 feet east of east end of station, 20 feet south of center of track; iron post, marked "2256 T."	2, 256. 451
Milepost H. 24, HLNA. 274, railroad spike on.....	2, 249. 17
Elk Creek; base of rail center of trestle 290.....	2, 231. 61
Elk Creek; surface of water under center of trestle 290.....	2, 187. 6
Milepost H. 25, HLNA. 273, railroad spike on	2, 236. 53
Milepost H. 26, HLNA. 272, railroad spike on	2, 242. 92
Milepost H. 27, HLNA. 271, railroad spike on	2, 198. 82
Milepost H. 28, HLNA. 270, railroad spike on	2, 172. 14
Milepost H. 29, HLNA. 269, opposite; 30 feet south of center of track, 100 feet west of east head block of switch at Snead's siding; iron post, marked "2169 T.".....	2, 169. 183
Milepost H. 30, HLNA. 268, railroad spike on	2, 173. 79
Milepost H. 31, HLNA. 267, railroad spike on	2, 178. 41
Milepost H. 32, HLNA. 266, railroad spike on	2, 184. 53
Milepost H. 33, HLNA. 265, railroad spike on	2, 177. 96
Noxon, top of rail in front of telegraph office	2, 180. 52
Noxon, 40 feet east of east corner of station, 13 feet north of center of track; iron post, marked "2182 T.".....	2, 181. 992
Milepost H. 34, HLNA. 264, railroad spike on	2, 180. 59
Trestle 288, base of rail center of.....	2, 192. 27
Trestle 288, water surface under center of	2, 182. 7
Milepost H. 35, HLNA. 263, railroad spike on	2, 218. 82
Milepost H. 36, HLNA. 262, railroad spike on	2, 262. 70
Milepost H. 37, HLNA. 261, railroad spike on	2, 251. 36
Milepost H. 38, HLNA. 260, 420 feet southeast of, 30 feet south of track; iron post, marked "2210 T.".....	2, 209. 536
Trestle 287, base of rail center of	2, 210. 04
Trestle 287, surface of water under center of.....	2, 181. 6
Milepost H. 39, HLNA. 259, railroad spike on	2, 211. 23
Milepost H. 40, HLNA. 258, railroad spike on	2, 215. 12
Milepost H. 41, HLNA. 257, railroad spike on	2, 219. 02
Milepost H. 42, HLNA. 256, railroad spike on	2, 221. 71
Tuscor, 33 feet southeast of southeast corner of section house, 49 feet west of center of track; iron post, marked "2232 T.".....	2, 231. 992
Bridge 286, base of rail center of.....	2, 228. 09
Bridge 286, water surface under center of.....	2, 199. 1
Milepost H. 44, HLNA. 254, railroad spike on	2, 274. 75
Trestle 285, base of rail center of.....	2, 289. 30
Trestle 285, surface of water under center of.....	2, 223. 3
Milepost H. 45, HLNA. 253, railroad spike on	2, 291. 77
Milepost H. 46, HLNA. 252, railroad spike on	2, 314. 59

TRIANGULATION AND SPIRIT LEVELING.

525

	Feet.
Milepost H. 47, HLNA. 251, railroad spike on	2,355.36
Trout Creek, 16 feet west of west end of telegraph office, 18 feet from center of track, 18 feet east of milepost H. 48, HLNA. 250; iron post, marked "2371 T."	2,370.882
Trout Creek; base of rail center of trestle 284	2,367.70
Trout Creek; surface of water under center of trestle 284	2,280.1
Milepost H. 49, HLNA. 249, railroad spike on	2,371.11
Milepost H. 50, HLNA. 248, railroad spike on	2,369.09
Milepost H. 51, HLNA. 247, railroad spike on	2,368.93
Milepost H. 52, HLNA. 246, railroad spike on	2,404.73
Milepost H. 53, HLNA. 245, railroad spike on	2,458.61
Vermillion, road crossing	2,480.2
Vermillion, 150 feet east of road crossing at west end of thorough cut, south side of railroad, 18 feet north of center of track; iron post, marked "2482 T."	2,481.973
Beaver Creek; base of rail center of trestle 283	2,467.48
Beaver Creek; water surface under center of trestle 283	2,397.5
Milepost H. 55, HLNA. 243, railroad spike on	2,506.26
Milepost H. 56, HLNA. 242, railroad spike on	2,541.96
Goodchild's Spur, road crossing east end of	2,562.3
Milepost H. 57, HLNA. 241, railroad spike on	2,570.61
Milepost H. 58, HLNA. 240, railroad spike on	2,581.71
White Pine, 12 feet west of car house, 18 feet east of corner of fence, 25 feet north of center of track; iron post, marked "2583 T."	2,583.021
Milepost H. 59, HLNA. 239, east of, 50 feet south of track; railroad spike on third telegraph pole	2,576.91
Milepost H. 60, HLNA. 238, railroad spike on	2,563.73
Milepost H. 61, HLNA. 237, railroad spike on	2,573.08
Milepost H. 62, HLNA. 236, 365 feet northwest of, 21 feet south of center of track; iron post, marked "2527 T."	2,527.248
Milepost H. 63, HLNA. 235, 2.4 feet east of; railroad spike on post of mud wall	2,468.73
Trestle 280, base of rail center of	2,415.78
Trestle 280, water surface under center of	2,370.2
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Belknap; base of rail in front of station	2,403.28
Clark Fork; first crossing, base of rail center of bridge	2,388.07
Clark Fork; first crossing, water surface under center of bridge	2,310.1
Milepost H. 66, HLNA. 232, 240 feet east of, at end of thorough cut, 25 feet north of center of railroad track, 360 feet east of east end of bridge 280 over Clark Fork; iron post, marked "2389 T."	2,388.567
Milepost H. 68, HLNA. 231, railroad spike on	2,413.66
Milepost H. 68, HLNA. 230, opposite, 230 feet south of track; copper nail on east stanchion of extra rail support	2,414.30
Milepost H. 69, HLNA. 229, railroad spike on	2,416.65
Milepost H. 70, HLNA. 228, railroad spike on	2,439.85
Thompson Falls, $\frac{1}{4}$ mile west of; road crossing	2,446.9
Thompson Falls, 40 feet east of east end of station, 16 feet south of center of track, 6 feet east of telegraph pole; iron post, marked "2439 T."	2,438.784
Milepost H. 72, HLNA. 226, opposite; copper nail on top of west stanchion of extra rail support	2,419.70
Milepost H. 73, HLNA. 225, railroad spike on	2,431.16
Milepost H. 74, HLNA. 224, railroad spike on	2,456.90
Woodlin siding; east head block	2,462.27
Milepost H. 75, HLNA. 223, railroad spike on	2,455.80

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Milepost H. 76, HLNA. 222, 1 mile east of, 22 feet south of center of track; iron post, marked "2433 T."	2, 432.540
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Milepost H. 77, HLNA. 221, railroad spike on	2, 415.57
Milepost H. 78, HLNA. 220, 75 feet west of; copper nail on east stanchion of extra rail support	2, 417.35
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Milepost H. 79, HLNA. 219, railroad spike on	2, 415.97
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Milepost H. 85, HLNA. 213, railroad spike on	2, 425.40
Milepost H. 86, HLNA. 212, railroad spike on	2, 430.14
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Milepost H. 88, HLNA. 210, railroad spike on	2, 448.0
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Milepost H. 93, HLNA. 205, railroad spike on	2, 459.18
Trestle 268, base of rail center of	2, 458.68
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Milepost H. 94, HLNA. 204, railroad spike on	2, 458.93
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Trestle 263, water surface under	2, 457.5
Trestle 263, base of rail center of	2, 483.36
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Milepost H. 99, HLNA. 199, railroad spike on	2, 480.16
Henry Creek; base of rail center of trestle 261	2, 480.02
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Milepost H. 100, HLNA. 198, railroad spike on	2, 479.55
Trestle 260, base of rail center of	2, 479.56
Trestle 260, water surface under center of	2, 460.4
Milepost H. 101, HLNA. 197, railroad spike on	2, 480.90
Milepost H. 102, HLNA. 196, railroad spike on	2, 487.32
Paradise, 4 feet east of southeast corner of fence at section house, 27 feet north of center of track; iron post, marked "2490 T."	2, 489.669

	Feet.
Milepost H. 103, HLNA. 196, railroad spike on	2,489.29
Trestle 259, base of rail center of	2,491.80
Trestle 259, water surface under center of	2,269.0
Milepost H. 104, HLNA. 194, railroad spike on	2,489.64
Milepost H. 105, HLNA. 193, railroad spike on	2,493.41
Milepost H. 106, HLNA. 192, railroad spike on	2,499.21
Milepost H. 107, HLNA. 191, railroad spike on	2,495.24
Milepost H. 108, HLNA. 190, railroad spike on	2,493.39
Olive siding, 1,000 feet south of Mrs. Lynch's house, 50 feet north of center of track, 4 feet east of telegraph pole; iron post, marked "2499 T."	2,498.515
Milepost H. 109, HLNA. 189, railroad spike on	2,494.53
Trestle 258; base of rail	2,495.62
Trestle 258, surface of water under	2,477.6
Olive siding, head block east end of	2,455.48
Milepost H. 110, HLNA. 188, railroad spike on	2,495.13
Trestle 257, base of rail center of	2,496.14
Trestle 256, base of rail center of	2,496.20
Trestle 256, water surface under center of	2,478.2
Milepost H. 111, HLNA. 187, railroad spike on	2,496.75
Flathead River, base of rail center of steel bridge 255	2,507.90
Flathead River, water surface under center of steel bridge 255	2,476.6
Milepost H. 112, HLNA. 186, railroad spike on	2,507.90
Trestle 254, base of rail center of	2,508.52
Milepost H. 113, HLNA. 185, 12 feet northeast of, 15 feet south of center of track; iron post, marked "2502 T."	2,501.827
Milepost H. 114, HLNA. 184, railroad spike on	2,503.43
Perma, base of rail in front of section house	2,505.66
Milepost H. 115, HLNA. 183, railroad spike on	2,502.41
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Milepost H. 118, HLNA. 180, 72 feet southwest of, 24 feet south of railroad track; iron post, marked "2508 T."	2,507.527
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Trestle 253, water surface under center of	2,490.9
Milepost H. 119, HLNA. 179, railroad spike on	2,515.57
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Milepost H. 121, HLNA. 177, railroad spike on	2,509.83
Trestle 249, base of rail center of	2,509.84
Trestle 249, water surface under center of	2,502.1
Trestle 248, base of rail center of	2,509.56
Trestle 248, water surface under center of	2,503.4
Trestle 247, base of rail center of	2,508.96
Milepost H. 122, HLNA. 176, railroad spike on	2,506.01
Duncan siding, east head block	2,509.17
Milepost H. 123, HLNA. 175, 480 feet west of, 15 feet south of center of track; iron post, marked "2510 T."	2,509.579
Milepost H. 124, HLNA. 174, railroad spike on	2,510.05
Milepost H. 125, HLNA. 173, railroad spike on	2,517.15
Trestle 244, base of rail center of	2,519.18
Milepost H. 126, HLNA. 172, railroad spike on	2,516.48
Trestle 243, base of rail center of	2,514.64
Milepost H. 127, HLNA. 171, railroad spike on	2,513.42

	Feet.
Milepost H. 128, HLNA. 170, railroad spike on.....	2, 515. 76
Jocko, 1 foot north of fence opposite station, 240 feet south of center of track; iron post, marked "2521 T."	2, 521. 006
Jocko, base of rail in front of station	2, 521. 60
Jocko River, base of rail center of trestle 241	2, 535. 70
Jocko River, surface of water under center of trestle 241	2, 525. 7
Milepost H. 130, HLNA. 168, railroad spike on.....	2, 535. 81
Trestle 240, base of rail center of.....	2, 568. 18
Trestle 240, surface of water under center of.....	2, 560. 6
Milepost H. 131, HLNA. 167, railroad spike on.....	2, 571. 04
Trestle 239, base of rail center of.....	2, 573. 87
Trestle 239, surface of water under center of.....	2, 567. 3
Milepost H. 132, HLNA. 166, railroad spike on.....	2, 598. 01
Milepost H. 133, HLNA. 165, railroad spike on.....	2, 624. 27
Milepost H. 134, HLNA. 164, 60 feet east of, 40 feet south of center of track; iron post, marked "2643 T."	2, 643. 211
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Trestle 236, water surface under center of.....	2, 682. 0
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Trestle 232, water surface under center of	2, 803. 4
Milepost H. 140, HLNA. 159, 70 feet west of, 21 feet north of track; iron post, marked "2815 T."	2, 814. 728
Trestle 231, base of rail center of	2, 816. 09
Trestle 231, water surface under center of	2, 809. 8
Milepost H. 141, HLNA. 157, railroad spike on	2, 851. 61
Milepost H. 142, HLNA. 156, railroad spike on	2, 901. 14
Milepost H. 143, HLNA. 155, railroad spike on	2, 951. 21
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Jocko River, base of rail trestle 225	3, 011. 17
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Trestle 222, base of rail center of	3, 044. 26
Trestle 222, water surface under trestle 222	3, 029. 6
Arlee, top of south rail in front of telegraph office	3, 083. 91
Arlee, 85 feet west of west corner of Chinese bunkhouse, 100 feet south of center of track, 165 feet southwest of milepost H. 146, HLNA. 152; iron post, marked "3093 T."	3, 092. 753
Post Arlee, 1 mile, railroad spike on	3, 164. 11
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Milepost H. 151, HLNA. 147, 240 feet east of, 15 feet north of track; iron post, marked "3561 T."	3,560.766
Trestle 217, base of rail center of	3,601.47
Milepost H. 152, HLNA. 146, railroad spike on	3,665.89
Milepost H. 153, HLNA. 145, 150 feet east of; head of square bolt on north guard rail of east end of trestle 216-2	3,780.10
Trestle 216, base of rail center of	3,830.13
Trestle 215, base of rail center of	3,853.95
Trestle 214, base of rail center of	3,860.90
Milepost H. 154, HLNA. 144, railroad spike on	3,879.70
Trestle 213, base of rail center of	3,899.88
Milepost H. 155, HLNA. 143, railroad spike on	3,931.88
Milepost H. 156, HLNA. 142, railroad spike on	3,943.80
Evato, top of south rail center of station	3,957.59
Evato, $\frac{1}{2}$ mile east of, 58 feet northwest of road crossing, 30 feet south of center of track, 200 feet southwest of milepost H. 157, HLNA. 141; iron post, marked "3957 T."	3,957.331
Trestle 208, base of rail center of	3,917.53
Milepost H. 158, HLNA. 140, railroad spike on	3,855.67
Milepost H. 159, HLNA. 139, railroad spike on	3,749.01
Marent trestle No. 206, base of rail center of (226 feet high)	3,675.66
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70. Report on Astronomical Work of 1889 and 1890, by Robert Simpson Woodward. 1890. 8°. 79 pp. Price 10 cents.
71. Index to the Known Fossil Insects of the World, including Myriapods and Arachnids, by Samuel Hubbard Scudder. 1891. 8°. 744 pp. Price 50 cents.
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75. Record of North American Geology for 1887 to 1889, inclusive, by Nelson Horatio Darton. 1891. 8°. 173 pp. Price 15 cents.
76. A Dictionary of Altitudes in the United States (Second Edition), compiled by Henry Gannett, Chief Topographer. 1891. 8°. 393 pp. Price 25 cents.
77. The Texan Permian and its Mesozoic Types of Fossils, by Charles A. White. 1891. 8°. 51 pp. 4 pl. Price 10 cents.
78. A Report of Work done in the Division of Chemistry and Physics, mainly during the Fiscal Year 1889-'90. F. W. Clarke, Chief Chemist. 1891. 8°. 131 pp. Price 15 cents.
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87. A Synopsis of American Fossil Brachiopoda, including Bibliography and Synonymy, by Charles Schuchert. 1897. 8°. 464 pp. Price 30 cents.
88. The Cretaceous Foraminifera of New Jersey, by Rufus Mather Bagg, jr. 1898. 8°. 89 pp. 6 pl. Price 10 cents.
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94. The Mechanism of Solid Viscosity, by Carl Barus. 1892. 8°. 138 pp. Price 15 cents.

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105. The Laramie and the Overlying Livingston Formation in Montana, by Walter Harvey Weed, with Report on Flora, by Frank Hall Knowlton. 1893. 8°. 68 pp. 6 pl. Price 10 cents.
106. The Colorado Formation and its Invertebrate Fauna, by T. W. Stanton. 1893. 8°. 288 pp. 45 pl. Price 20 cents.
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126. A Mineralogical Lexicon of Franklin, Hampshire, and Hampden Counties, Massachusetts, by Benjamin Kendall Emerson. 1895. 8°. 180 pp. 1 pl. Price 15 cents.
127. Catalogue and Index of Contributions to North American Geology, 1732-1891, by Nelson Horatio Darton. 1896. 8°. 1045 pp. Price 60 cents.
128. The Bear River Formation and its Characteristic Fauna, by Charles A. White. 1895. 8°. 108 pp. 11 pl. Price 15 cents.
129. Earthquakes in California in 1894, by Charles D. Perrine. 1895. 8°. 25 pp. Price 5 cents.
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131. Report of Progress of the Division of Hydrography for the Calendar Years 1893 and 1894, by Frederick Haynes Newell, Topographer in Charge. 1895. 8°. 126 pp. Price 15 cents.
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134. The Cambrian Rocks of Pennsylvania, by Charles Doolittle Walcott. 1896. 8°. 43 pp. 15 pl. Price 5 cents.
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146. Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the Year 1895, by F. B. Weeks. 1896. 8°. 130 pp. Price 15 cents.
147. Earthquakes in California in 1895, by Charles D. Perrine, Assistant Astronomer in Charge of Earthquake Observations at the Lick Observatory. 1896. 8°. 23 pp. Price 5 cents.
148. Analyses of Rocks, with a Chapter on Analytical Methods, Laboratory of the United States Geological Survey, 1880 to 1896, by F. W. Clarke and W. F. Hillebrand. 1897. 8°. 306 pp. Price 20 cents.
149. Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the Year 1896, by Fred Boughton Weeks. 1897. 8°. 152 pp. Price 15 cents.
150. The Educational Series of Rock Specimens Collected and Distributed by the United States Geological Survey, by Joseph Silas Diller. 1898. 8°. 400 pp. 47 pl. Price 25 cents.
151. The Lower Cretaceous Gryphaeas of the Texas Region, by R. T. Hill and T. Wayland Vaughan. 1898. 8°. 139 pp. 35 pl. Price 15 cents.
152. A Catalogue of the Cretaceous and Tertiary Plants of North America, by F. H. Knowlton. 1898. 8°. 247 pp. Price 20 cents.
153. A Bibliographic Index of North American Carboniferous Invertebrates, by Stuart Weller. 1898. 8°. 653 pp. Price 35 cents.
154. A Gazetteer of Kansas, by Henry Gannett. 1898. 8°. 246 pp. 6 pl. Price 20 cents.
155. Earthquakes in California in 1896 and 1897, by Charles D. Perrine, Assistant Astronomer in Charge of Earthquake Observations at the Lick Observatory. 1898. 8°. 47 pp. Price 5 cents.
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160. A Dictionary of Altitudes in the United States (Third Edition), compiled by Henry Gannett. 1899. 8°. 775 pp. Price 40 cents.
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157. The Gneisses, Gabbro-Schists, and Associated Rocks of Southwestern Minnesota, by Christopher Webber Hall. 1899. 8°. — pp. 27 pl. Price — cents.
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159. The Geology of Eastern Berkshire County, Massachusetts, by B. K. Emerson. 1899. 8°. 139 pp. 9 pl. Price 20 cents.
163. Flora of the Montana Formation, by Frank Hall Knowlton.
- Reconnaissance in the Rio Grande Coal Fields of Texas, by Thomas Wayland Vaughan, including a Report on Igneous Rocks from the San Carlos Coal Fields, by E. C. E. Lord.

WATER-SUPPLY AND IRRIGATION PAPERS.

By act of Congress approved June 11, 1896, the following provision was made:

"Provided, That hereafter the reports of the Geological Survey in relation to the gauging of streams and to the methods of utilizing the water resources may be printed in octavo form, not to exceed one hundred pages in length and five thousand copies in number; one thousand copies of which shall be for the official use of the Geological Survey, one thousand five hundred copies shall be delivered to the Senate, and two thousand five hundred copies shall be delivered to the House of Representatives, for distribution."

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Under this law the following papers have been published:

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 5. Irrigation Practice on the Great Plains, by Elias Branson Cowgill. 1897. 8°. 39 pp. 12 pl.
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 8. Windmills for Irrigation, by E. C. Murphy. 1897. 8°. 49 pp. 8 pl.
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 11. River Heights for 1896, by Arthur P. Davis. 1897. 8°. 100 pp.
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 15. Operations at River Stations, 1897, Part I. 1898. 8°. 100 pp.
 16. Operations at River Stations, 1897, Part II. 1898. 8°. 101-200 pp.
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 30. Water Resources of the Lower Peninsula of Michigan, by Alfred C. Lane. 1899. 8°. 97 pp. 7 pl.
- In preparation:*
31. Lower Michigan Mineral Waters, by Alfred C. Lane.
 32. Water Resources of Porto Rico, by Herbert M. Wilson.

TOPOGRAPHIC MAP OF THE UNITED STATES.

When, in 1882, the Geological Survey was directed by law to make a geologic map of the United States, there was in existence no suitable topographic map to serve as a base for the geologic map. The preparation of such a topographic map was therefore immediately begun. About one-fifth of the area of the country, excluding Alaska, has now been thus mapped. The map is published in atlas sheets, each sheet representing a small quadrangular district, as explained under the next heading. The separate sheets are sold at 5 cents each when fewer than 100 copies are purchased, but when they are ordered in lots of 100 or more copies, whether of the same sheet or of different sheets, the price is 2 cents each. The mapped areas are widely scattered, nearly every State being represented. About 900 sheets have been engraved and printed; they are tabulated by States in the Survey's "List of Publications," a pamphlet which may be had on application.

The map sheets represent a great variety of topographic features, and with the aid of descriptive text they can be used to illustrate topographic forms. This has led to the projection of an educational series of topographic folios, for use wherever geography is taught in high schools, academies, and colleges. Of this series the first folio has been issued, viz:

1. Physiographic types, by Henry Gannett, 1898, folio, consisting of the following sheets and 4 pages of descriptive text: Fargo (N. Dak.-Minn.), a region in youth; Charleston (W. Va.), a region in maturity; Caldwell (Kans.), a region in old age; Palmyra (Va.), a rejuvenated region; Mount Shasta, (Cal.), a young volcanic mountain; Eagle (Wis.), moraines; Sun Prairie (Wis.), drumlins; Donaldsonville (La), river flood plains; Boothbay (Me.), a fiord coast; Atlantic City (N. J.), a barrier-beach coast.

GEOLOGIC ATLAS OF THE UNITED STATES.

The Geologic Atlas of the United States is the final form of publication of the topographic and geologic maps. The atlas is issued in parts, or folios, progressively as the surveys are extended, and is designed ultimately to cover the entire country.

Under the plan adopted the entire area of the country is divided into small rectangular districts (designated *quadrangles*), bounded by certain meridians and parallels. The unit of survey is also the

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unit of publication, and the maps and descriptions of each rectangular district are issued as a folio of the Geologic Atlas.

Each folio contains topographic, geologic, economic, and structural maps, together with textual descriptions and explanations, and is designated by the name of a principal town or of a prominent natural feature within the district.

Two forms of issue have been adopted, a "library edition" and a "field edition." In both the sheets are bound between heavy paper covers, but the library copies are permanently bound, while the sheets and covers of the field copies are only temporarily wired together.

Under the law a copy of each folio is sent to certain public libraries and educational institutions. The remainder are sold at 25 cents each, except such as contain an unusual amount of matter, which are priced accordingly. Prepayment is obligatory. The folios ready for distribution are here listed:

No.	Name of sheet.	State.	Limiting meridians.	Limiting parallels.	Area, in square miles.	Price, in cents.
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2	Ringgold	Georgia..	85°-85° 30'	34° 30'-35°	980	25
3	Placerville	Tennessee	120° 30'-121°	38° 30'-39°	932	25
4	Kingston	California.	84° 30'-85°	35° 30'-36°	969	25
5	Sacramento	Tennessee	121°-121° 30'	38° 30'-39°	932	25
6	Chattanooga	California.	85°-85° 30'	35°-35° 30'	975	25
7	Pikes Peak *	Tennessee	105°-105° 30'	38° 30'-39°	932	25
8	Sewanee	Colorado..	85° 30'-86°	35°-35° 30'	975	25
9	Anthracite-Crested Butte.	Tennessee	106° 45'-107° 15'	38° 45'-39°	465	50
10	Harpers Ferry	Virginia..	77° 30'-78°	39°-39° 30'	925	25
11	Jackson	West Va..	120° 30'-121°	38°-38° 30'	938	25
12	Estillville	Maryland.	82° 30'-83°	36° 30'-37°	957	25
13	Fredericksburg	Virginia..	77°-77° 30'	38°-38° 30'	938	25
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16	Knoxville	Tennessee	83° 30'-84°	35° 30'-36°	925	25
17	Marysville	N. Carolina	121° 30'-122°	39°-39° 30'	925	25
18	Smartsville	California.	121°-121° 30'	39°-39° 30'	925	25
19	Stevenson	Alabama..	85° 30'-86°	34° 30'-35°	980	25
20	Cleveland	Georgia..	84° 30'-85°	35°-35° 30'	975	25
21	Pikeville	Tennessee	85°-85° 30'	35° 30'-36°	960	25
22	McMinnville	Tennessee	85° 30'-86°	35° 30'-36°	969	25
23	Nomini	Maryland.	76° 30'-77°	38°-38° 30'	938	25
24	Three Forks	Virginia..	111°-112°	45°-46°	3,354	50
25	Loudon	Montana..	84°-84° 30'	35° 30'-36°	969	25
26	Pocahontas	Tennessee	81°-81° 30'	37°-37° 30'	951	25
27	Morristown	West Va..	83°-83° 30'	36°-36° 30'	963	25
28	Piedmont	Tennessee	79°-79° 30'	39°-39° 30'	925	25
29	Nevada City: Nevada City, Grass Valley, Banner Hill.	Maryland.	79°-79° 30'	39°-39° 30'	925	25
30	Yellowstone National Park: Gallatin Canyon, Shoshone Lake.	West Va..	121° 00' 25"-121° 03' 45" 121° 01' 35"-121° 05' 04" 120° 57' 05"-121° 00' 25"	39° 13' 50"-39° 17' 16" 39° 10' 22"-39° 13' 50" 39° 13' 50"-39° 17' 16"	11.65 12.09 11.65	50
31	Pyramid Peak	California.	110°-111°	44°-45°	3,412	75
32	Franklin	Wyoming.	120°-120° 30'	38° 30'-39°	932	25
33	Briceville	Virginia..	79°-79° 30'	38° 30'-39°	932	25
34	Buckhannon	West Va..	84°-84° 30'	36°-36° 30'	963	25
35	Gadsden	Tennessee	80°-80° 30'	38° 30'-39°	932	25
36	Pueblo	West Va..	86°-86° 30'	34°-34° 30'	966	25
37	Downsville	Alabama.	104° 30'-105°	38°-38° 30'	938	50
38	Butte Special	Colorado..	120° 30'-121°	39° 30'-40°	919	25
39	Truckee	California.	112° 29' 30"-112° 36' 42"	45° 59' 28"-46° 02' 54"	22.80	50
40	Wartburg	Montana..	120°-120° 30'	38°-39° 30'	925	25
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42	Nueces	Tennessee	120°-120° 30'	37° 30'-38°	944	25
43	Bidwell Bar	Texas	100°-100° 30'	29° 30'-30°	1,035	25
		California.	121°-121° 30'	39° 30'-40°	918	25

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No.	Name of sheet.	State.	Limiting meridians.	Limiting parallels.	Area, in square miles.	Price, in cents.
44	Tazewell	Virginia..	81° 30'–82°	37°–37° 30'	950	25
45	Boise	West Va..	116°–116° 30'	43° 30'–44°	884	25
46	Richmond	Idaho.....	84°–84° 30'	37° 30'–38°	944	25
47	London	Kentucky	84°–84° 30'	37°–37° 30'	950	25
48	Tennile District Special.	Colorado..	106° 8'–106° 18'	39° 22' 30"–39° 30' 30"	55	25
49	Roseburg	Oregon ...	123°–123° 30'	43°–43° 30'	871	25
50	Holyoke	Mass	72° 30'–73°	42°–42° 30'	885	50
51	Big Trees	Conn	120°–120° 30'	38°–38° 30'	938	25

STATISTICAL PAPERS.

Mineral Resources of the United States, 1882, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Mineral Resources of the United States, 1883 and 1884, by Albert Williams, jr. 1885. 8°. xiv, 1016 pp. Price 60 cents.

Mineral Resources of the United States, 1885. Division of Mining Statistics and Technology. 1886. 8°. vii, 576 pp. Price 40 cents.

Mineral Resources of the United States, 1886, by David T. Day. 1887. 8°. viii, 813 pp. Price 50 cents.

Mineral Resources of the United States, 1887, by David T. Day. 1888. 8°. vii, 832 pp. Price 50 cents.

Mineral Resources of the United States, 1888, by David T. Day. 1890. 8°. vii, 652 pp. Price 50 cents.

Mineral Resources of the United States, 1889 and 1890, by David T. Day. 1892. 8°. viii, 671 pp. Price 50 cents.

Mineral Resources of the United States, 1891, by David T. Day. 1893. 8°. vii, 630 pp. Price 50 cents.

Mineral Resources of the United States, 1892, by David T. Day. 1893. 8°. vii, 850 pp. Price 50 cents.

Mineral Resources of the United States, 1893, by David T. Day. 1894. 8°. viii, 810 pp. Price 50 cents.

On March 2, 1895, the following provision was included in an act of Congress:

"Provided, That hereafter the report of the mineral resources of the United States shall be issued as a part of the report of the Director of the Geological Survey."

In compliance with this legislation the following reports have been published:

Mineral Resources of the United States, 1894, David T. Day, Chief of Division. 1895. 8°. xv, 646 pp., 23 pl.; xix, 735 pp., 6 pl. Being Parts III and IV of the Sixteenth Annual Report.

Mineral Resources of the United States, 1895, David T. Day, Chief of Division. 1896. 8°. xxiii, 542 pp., 8 pl. and maps; iii, 543–1053 pp., 9–13 pl. Being Part III (in 2 vols.) of the Seventeenth Annual Report.

Mineral Resources of the United States, 1896, David T. Day, Chief of Division. 1897. 8°. xii, 642 pp., 1 pl.; 643–1400 pp. Being Part V (in 2 vols.) of the Eighteenth Annual Report.

Mineral Resources of the United States, 1897, David T. Day, Chief of Division. 1898. 8°. viii, 681 pp., 11 pl.; viii, 706 pp. Being Part VI (in 2 vols.) of the Nineteenth Annual Report.

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